MANAGEMENT INDICATOR SPECIES ASSESSMENT: APACHE-SITGREAVES NATIONAL FOREST

Management Indicator Species Assessment

Apache-Sitgreaves National Forest

USDA Forest Service - Southwestern Region

September 2006

Introduction

The following species profiles are assessments of species designated as management indicator species (MIS) in the 1987 Apache-Sitgreaves Land and Resource Management Plan. These profiles will discuss factors affecting populations and habitats for each species in the Apache-Sitgreaves NF including an estimate of habitat and population trend.

MANAGEMENT INDICATOR SPECIES (MIS)

Management indicator species (MIS) were defined in the 1982 forest planning regulations (36 CFR 219) implementing the National Forest Management Act (NFMA) of 1976. MIS are a subset of all animal and plant species in a planning area that are selected for planning and management purposes. A key reason MIS are selected is "because their population changes are believed to indicate the effects of management activities" (36 CFR 219.19(a)(1). MIS are selected to represent several categories, such as commonly hunted or fished species, nongame species, and threatened and endangered species (TES).

Management indicator species are identified during the development process of a forest's land and resource management plan (hereafter referred to as the Apache-Sitgreaves Forest Plan). The 1987 Apache-Sitgreaves Forest Plan designates specific MIS with habitats in the Apache-Sitgreaves National Forest. These species are:

MIS	Habitat
Mule deer	Early succession
Turkey	Late succession
Abert squirrel	Early succession
Pygmy nuthatch	Late succession
Goshawk	Late succession
Spotted owl	Late succession
Red squirrel	Late succession
Antelope	Early succession
Elk	Early succession
Yellow-bellied sapsucker	Snags (aspen)
Plain titmouse	Snags
Hairy woodpecker	Snags
Lincoln's sparrow	High elevation riparian
Yellow-breasted chat	Low elevation
Cinnamon teal	Wetlands
Lucy's warbler	Low-elevation riparian

The rationale for selecting these species is discussed in the Apache-Sitgreaves Forest Plan Environmental Impact Statement.

MIS HABITAT TRENDS

The 1987 Environmental Impact Statement (EIS) for the Apache-Sitgreaves Forest Plan described the habitat groups and characteristics along with projected trends of management indicator species, based on current direction and management of these habitats. The basis for determining habitat trend is a comparison of estimated occupied habitats at the time of preparing the Forest Plan to the present. The methods used to determine current habitats were developed to approximate similarity (to the degree possible) to the acreages used in the 1987 Forest Plan EIS. The rationale and methods used to reach the current habitat estimates are described for each species or group. Appendix A contains a detailed description of habitat trend for each of the representative habitats for which MIS were selected. The appropriate portion of this habitat trend analysis is incorporated into each species profile along with a discussion of additional specific habitat features pertinent to the species.

MIS POPULATION TRENDS

In addition to defining management indicator species, the forest planning regulations direct that "Population trends of management indicator species will be monitored and relationships to habitat changes determined" (36 CFR 219.9 (a)(6)). The Apache-Sitgreaves Forest Plan Monitoring Plan identified monitoring objectives, frequency of monitoring, and responsible party for accomplishing monitoring. For several commonly hunted species, the monitoring plan specified Arizona Game and Fish Department as having primary responsibility for monitoring populations of these species. The monitoring plan was amended in 1992 and some of the monitoring items were dropped or redefined due to financial constraints or duplication with other monitoring programs (Forest Plan Amendment #5). The monitoring plan as amended is provided in Appendix B. The species profiles included in this assessment provide information on the relationship of each species to forest communities, forest successional classes, aquatic communities, rare communities, or relevant habitat parameters. These relationships are supported by documentation of published and unpublished research, professional opinion, administrative studies and surveys, effectiveness monitoring, or from ongoing research and validation monitoring.

Because methods determine population numbers and/or estimated trends vary by species, conclusions that relate population trends to habitat conditions are also reached through a variety of methods. This assessment uses a combination of the methods to determine the population trend for each of the MIS identified for the Apache-Sitgreaves National Forest. Information sources on MIS populations include (but are not limited to) Arizona Game and Fish Department harvest and survey data, National Forest System information (e.g. local Forest and Regional data), Forest Service Research (e.g. Forest Service Intermountain Research Station literature), university research, other federal and state government agencies (e.g. Patuxent Wildlife Center breeding bird surveys) and an assortment of nongovernment organizations (e.g., Partners in Flight, NatureServe Explorer). Forest Service policy (36 CFR 219.19(a)(6)) recognizes the need to use outside sources, "...monitoring will be done in cooperation with State fish and wildlife agencies, to the extent practicable."

From known relationships between species and habitat, trends in amount and condition of habitat over time may also reflect population trends. This is not necessarily the situation in all circumstances. Population trends can often relate to other outside forces,

such as predation, hunting, nest parasitism, or detrimental impacts to other migratory habitats.

Population trend is most appropriately addressed at scales above the project level. Many of these selected MIS species occur and range far beyond a local scale. Individuals, family groups, flocks, or herds annually use areas much larger than the analysis area and population trend must be examined on a greater scale to be meaningful. Evidence from long-term censuses suggests that few natural populations or communities persist at or near equilibrium on a local scale (Martin and Finch 1995). At a site-specific project level, there is a great deal of fluctuation in wide ranging populations. For this reason, it is not appropriate to determine population trend at the local level. For National Forest Management Act implementation, population trend is addressed at the scale of the Apache-Sitgreaves National Forest. Even at this level, population trend information is not likely to be indicative of overall population trends of a species.

The FEIS for the Apache-Sitgreaves Forest Plan analyzed the Proposed Action and five alternatives. The Apache-Sitgreaves Forest Plan decision alternative is described relative to projected impacts on management indicator species over the life of the plan, taking into account the estimated annual volume to be harvested from the Forest and the effects of other authorized activities. The Plan includes specific management direction designed to protect, maintain, and improve habitat for MIS during the course of other forest management activities. This management direction is summarized in Appendix C.

SUMMARY OF HABITAT AND POPULATION TRENDS FOR THE APACHE-SITGREAVES NF

Based on the information regarding habitat conditions and population parameters discussed in detail in each of the species profiles, a determination of habitat and population trend was made for each MIS. These determinations are shown in Table 1.

Table 1. Summary of habitat and population trend determinations for management indicator species in the Apache-Sitgreaves NF

MIS	HABITAT	HABITAT TREND[1]	POPULATION TREND[2]
Mule deer	Early succession	Upward	Downward
Turkey	Late succession	Upward	Stable
Abert squirrel	Early succession	Upward	Stable
Pygmy nuthatch	Late succession	Upward	Stable
Goshawk	Late succession	Upward	Stable
Spotted owl	Late succession	Upward	Stable
Red squirrel	Late succession	Upward	Stable
Antelope	Early succession	Upward	Stable
Elk	Early succession	Upward	Stable
Yellow-bellied sapsucker	Snags (aspen)	Stable	Stable
Plain titmouse	Snags	Upward	Stable

MIS	HABITAT	HABITAT TREND[1]	POPULATION TREND[2]
Hairy woodpecker	Snags	Upward	Stable
Lincoln's sparrow	High elevation riparian	Static	Stable
Yellow-breasted chat	Low elevation	Upward	Stable
Cinnamon teal	Wetlands	Upward	Stable
Lucy's warbler	Low elevation riparian	Upward	Stable

[1] Habitat trend determination is taken from Appendix A-Habitat Trend Summary for the representative habitat type assigned in the Forest Plan.

[2] Population trend determination is taken from each species profile.

UPDATES

This status report is reviewed annually, and is updated as needed.

Individual species reports were last updated in September 2006.

Abert's squirrel (*Sciurus aberti)*

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the Abert's squirrel is an indicator species for early-succession habitat (USDA 1987a, p.134). The Abert's squirrel (*Sciurus aberti*) is a large, tassel-eared tree squirrel indigenous to the ponderosa pine forests of the Rocky Mountains and southwestern mountain ranges. Abert's squirrels were identified in the Analysis of the Management Situation (AMS) (USDA Forest Service 1983) to represent species associated with ponderosa pine.

These squirrels are highly dependent on ponderosa pine for food, nests, cover from predators and shelter. Abert's squirrels eat the inner cambium of the bark, buds, flowers, and seeds of the pines, but do supplement their diets with mushrooms when available. The breeding season coincides with the emergence of the staminate cones in early spring, when the female goes into estrus for only one day. Feeding by squirrels appears to have negligible effect on ponderosa pine growth (Hall 1981).

Optimum habitat consists of relatively open stands of pure ponderosa pine where trees about 11-13 inches DBH predominate (Hall 1981, Brown 1984), although interlocking canopies and larger mature trees that produce more cones are also key habitat components (Brown 1984, Hoffmeister 1986). Hoffmeister 1986, pp. 201-202) also comments that "Overmature trees produce poor cones, and the inner bark is less nutritious. Thus these [older] forests may be less supportive of Abert's squirrels than they were at an earlier time." Information from the Forests' current Geographic Information System layer (USDA Forest Service 2005) shows an estimated 746,902 acres of ponderosa pine cover type on the Apache-Sitgreaves National Forests. The distribution of ponderosa pine forests in the Apache-Sitgreaves NF is displayed in Figure 1.

Management Activities or Natural Events That May Affect Habitat

Negative: Primarily related to long term cumulative effects of forest succession after heavy logging, long term fire suppression and some overstory removal prescriptions and wildfire.

Positive: Thinning, prescribed fire and low intensity wildfire intended to maintain large diameter mature ponderosa pine trees.

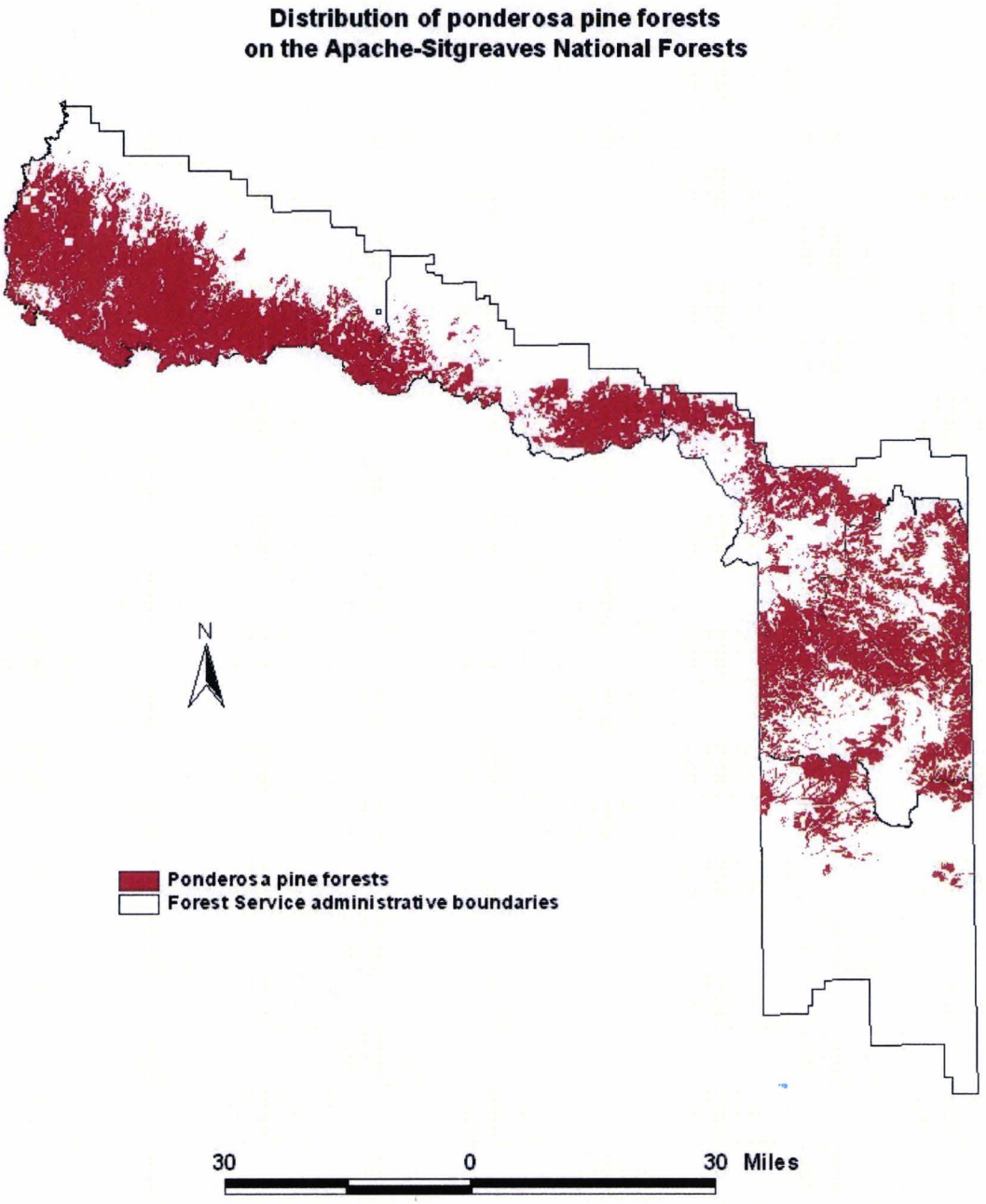


Figure 1. Distribution of ponderosa pine forests on the Apache-Sitgreaves National Forests.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

In the Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), includes specific "Standards and Guidelines" that are expected to help maintain or improve Abert's squirrel habitat components in Management Area 1 - Timberland include:

- Use integrated resource management in design of timber harvests to create habitat conditions needed by a variety of wildlife species in a cost effective manner (revised per Amendment 1).
- Manage to provide a variety of stand sizes, shapes, crown closure, edge contrast, age structure, and interspersion.
- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement p. 122-2).
- Implement the Forest snag policy. Provide at least 55% of a diversity unit with at least 180 snags per 100 acres. In high-priority areas, including both edge habitats adjacent to meadows or other water, manage for an average of 280 snags per 100 acres.
- Provide a minimum of 2 down logs per acres (12" diameter or larger) or untreated slash piles 10-foot in diameter or a combination of down logs and slash piles over 55% of a diversity unit.
- Provide big game, non-game, and upland game habitat in aspen.
- As needed to meet habitat capability, retain at least 20 Abert's squirrel nest tree groups per 100 acres.

Record of Decision for Amendment of Forest Plans (1996) provides guidelines relative to the management of both Mexican spotted owl and northern goshawk habitat. The Abert's squirrel is an important prey species for the goshawk and habitat management direction that applies to maintaining or improving squirrel habitat includes:

- Direction for the management of "old growth" habitats including well-defined, minimum criteria. Specifically, the amendment directs the allocation of "no less than 20 percent of each forested ecosystem management area to old growth" where "allocations will consist of landscape percentages meeting old growth conditions and not specific acres" (p. 122).
- Direction that defines vegetative objectives for PFAs.
- Direction extending the management of "Foraging Areas" to all forested landscapes outside PFAs with well defined objectives for vegetative structure. Management direction for snag densities, canopy-cover and other forest parameters are defined at the landscape level to promote sustainable prey populations for goshawks (e.g. related to snag densities) in addition meeting cover requirements for goshawks during the breeding season.
- Direction related to snag and down wood densities to promote sustainable prey populations specifically includes:
  - ✓ Leave at least 2 snags/acre and 3 downed logs/acre in ponderosa pine forests.

- ✓ Leave at least 3 snags/acre and 5 downed logs/acre in mixed-conifer forests.
- ✓ Leave at least 3 snags/acre and 5 downed logs/acre in spruce-fir forests.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was early succession habitat. Abert's squirrels were also identified in the AMS to represent species associated with ponderosa pine. However, early succession forests do not meet Abert's squirrel habitat needs. Abert's squirrels require forests of at least mid-succession age to provide cones and the underground fungi needed for survival and growth. The association of Abert's squirrels with "Early Succession" ponderosa pine forests may be a typographical error, as further indicated in the EIS. Page 208 of the EIS states: "All alternatives increase habitat capability for this species due to increased acres in the mid- to mature successional states by the fifth decade." This statement tends to support the earlier statement that Abert's squirrels would be an indicator of mid- to late successional forests rather than early successional stages. In addition, habitat capability modeling (i.e. R03WILD) assigned higher coefficients to more mature stands of ponderosa pine, that to earlier-successsion stands.

The "Habitat Quality Index Model" (version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for Abert's squirrel. Coefficients for this model were based on those used in the "R03WILD Habitat Capability Index Model", and were specific to the vegetative structure of ponderosa pine gambel oak cover types. The distribution (acres) of forest structure (e.g. vegetative structural stage, even/uneven age-class) by cover type was derived from the 1996 Forest Inventory Assessment (FIA) data (USDA Forest Service 2003a) and analyzed by the Forest Silviculturist. In 1996, the FIA data indicated that there were 752,013 acres of ponderosa pine habitat on the Forests. No extensive perturbations in these cover types are known to have occurred since 1996 and prior to the Rodeo-Chediski fires that would likely alter the overall distribution of these habitats across the Forest. The current Geographic information System vegetation layer indicates that there are 746,902 acres. The habitat quality index (HQI) generated by this model indicates that Forest, as of 1996, provides overall habitat at about 50% of its capability for the Abert's squirrels. In descriptive terms, the model predicts that the Apache-Sitgreaves National Forests provides moderate quality habitat for squirrel.

The primary concern for Abert's squirrel indicated in the Forest Plan appeared to involve the reduction in "mid-successional" forests of ponderosa pine. Both natural and human events can affect forest succession. Timber harvest can reduce the amount of existing and developing late-succession habitat and effect squirrel density. In Utah, Pederson et al. (1976) radio-tracked squirrels during the summer on home ranges before and after timber harvests. Seven home ranges in this study averaged 6.2 acres before harvest, and three of these home ranges averaged 32.0 acres after harvest, indicating that timber harvesting can have an effect on squirrel density. Likewise Dodd (2003) found that squirrel densities in optimal habitat were >2.5 times the density of squirrels in marginal habitat.

From 1985 through 2001, about 131,732 acres of mid- and high-elevation forested lands were impacted by the mechanical removal of trees (see Table 1). No information is available indicating the structural stage characteristics of these acres prior to mechanical

treatment. However, most of these types of harvest involve trees at least mid-successional stages and would tend to open stands, remove larger diameter trees, and reduce the amount of interlocking canopy. Group selections may not adversely affect squirrel habitat because they typically create only small openings and leaving surrounding canopies intact.

Table 1. Summary of the number of acres of timber harvest in ponderosa pine habitat by decade in the Apache-Sitgreaves NF.

Treatments in ponderosa pine	1985-1996 Acres	1997-2001 Acres	TOTAL ACRES
Overstory/Partial Removal	41,782	129	41,911
Intermediate & Individual Selection	72,224	15,848	88,072
Seed cut	15,279	1,643	16,922
Clearcut	478	0	478
Group Selection	1,969	2,261	4,230
Total Acres	131,732	19,881	172,005
Avg. Acres/Year	10,978	3,976	-

The Forest Plan EIS considered effects to old growth in developing the Allowable Sale Quantity authorized under each alternative. The Forest Plan authorized about 18,000 acres of timber harvest annually. The figure below depicts the levels of projected versus actual timber harvest over the life of the Forest Plan. Actual harvest information is from Forest records (Beal unpub. data). The projected harvest is based on the figure listed in the Forest Plan EIS for Alternative D of 18,080 acres annually (USDA Forest Service 1987b, p. 199). Actual harvest has varied considerably between years but has been declining overall as shown by the trend line in the graph below. Thus habitat alterations due to timber harvest that adversely affects Abert's squirrel habitat are declining.

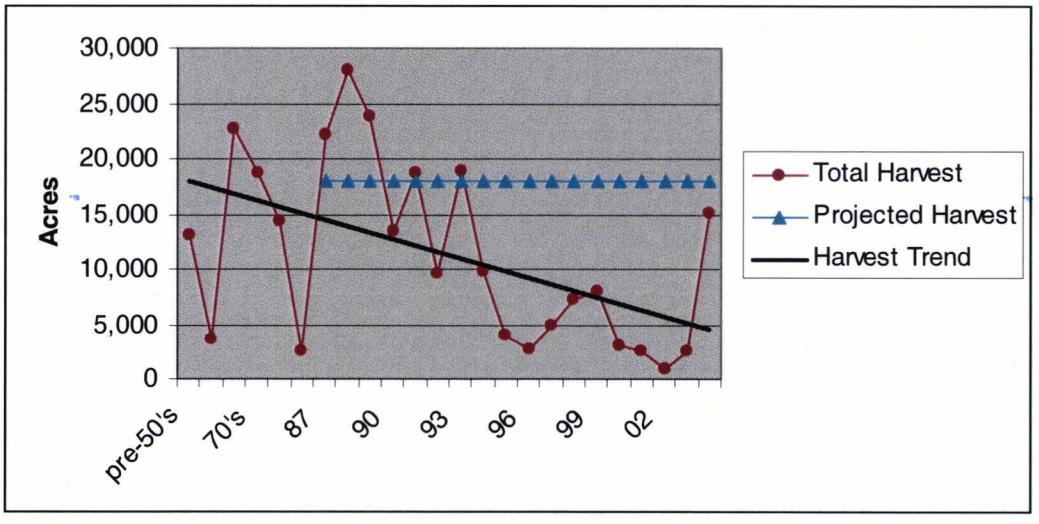


Figure 3. Actual vs. projected timber harvest in the Apache-Sitgreaves NF (1950-2004).

Wildfire can destroy existing mature forests used by Abert's squirrels, as well as, kill younger stands before they can develop into mature stands. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an

average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 2. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771. About half of these acres were probably pine based on the amount of that habitat type on the Forest.

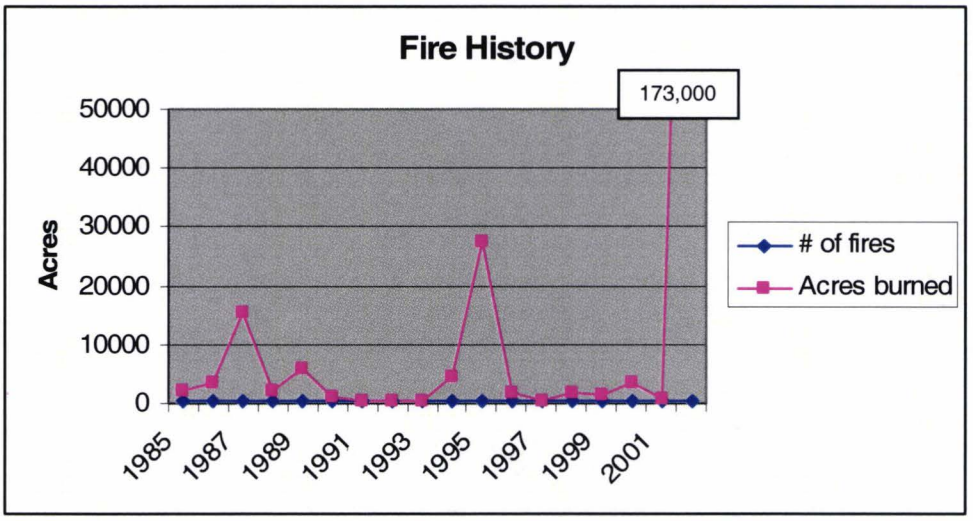
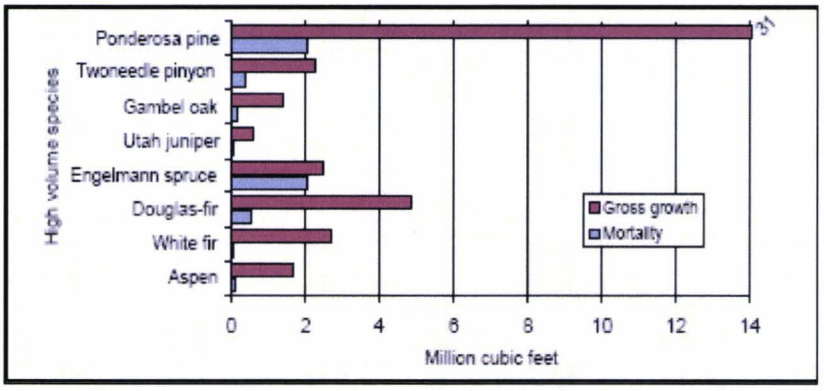


Figure 2. Summary of acres burned annually by wildfire in the Apache-Sitgreaves NF (1985-2002). Actual figure in 2002 was 173,000 acres.

The Apache-Sitgreaves NF has sustained large wildfires since 2000. The largest of these was the Rodeo-Chediski fire of 2002. That fire burned 173,107 acres of the Apache-Sitgreaves NF. As discussed previously, the Sitgreaves portion of the Forest was deficit in old growth in 1987. Prior to the fire, only about 2% of the burned area was in "old forest" conditions (USDA Forest Service 2003b). About half of this was lost in the fire. There were 324 stands comprising 26,546 acres that had been designated for old growth management within the burn perimeter. The 15,366 acres of this designated old growth that burned at high or moderate intensity are no longer considered appropriate for old growth management. On a Forest-wide basis, the fire had only a very small effect on existing late-succession habitat.

The fire had a somewhat greater effect on mid-age and mature forests. Mid-age (VSS 4) and mature (VSS 5) structural stages comprised 19% and 11% of the landscape prior to the fires. These were reduced to 9% and 5% respectively following the fire. About 27,697 acres of suitable Abert's squirrel habitat were lost.

Another factor in the development of old growth across the Forest is the annual rate of forest growth. The FIA report (USDA Forest Service 2003a) discusses the net annual growth of trees in the Forest by comparing estimated gross annual growth and gross annual mortality. Total mortality is about 13% of total annual growth. Figure 4 compares gross annual growth to mortality for eight common forest types. Growth in most types, except Englemann spruce, far outstrips mortality in the Apache-Sitgreaves NF. Thus, the forest is getting older and thicker over time. This is another indication that late succession is continuing to develop in the Forest.



Source: USDA Forest Service 2003a.

Figure 4. Gross annual growth of live trees 5 inches diameter and greater compared to mortality on all forested land, Apache-Sitgreaves NF, 1996

Insects or disease may also influence habitat capability for Abert's squirrels at either localized levels or at the landscape level. Scattered tree mortality may improve certain habitat components favored by Abert's squirrels such as encouraging growth of fungi used for food. But extensive die-offs may reduce habitat by killing entire stands of mature trees. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 5. Infestations vary widely from year to year but continue to be present in the Forest creating pockets or larger areas of tree mortality. The most recent infestation in 2003 created only scattered dead trees (2-3 trees/acre) across thousands of acres. Insect infestations appear to be at endemic levels that would benefit Abert's squirrels.

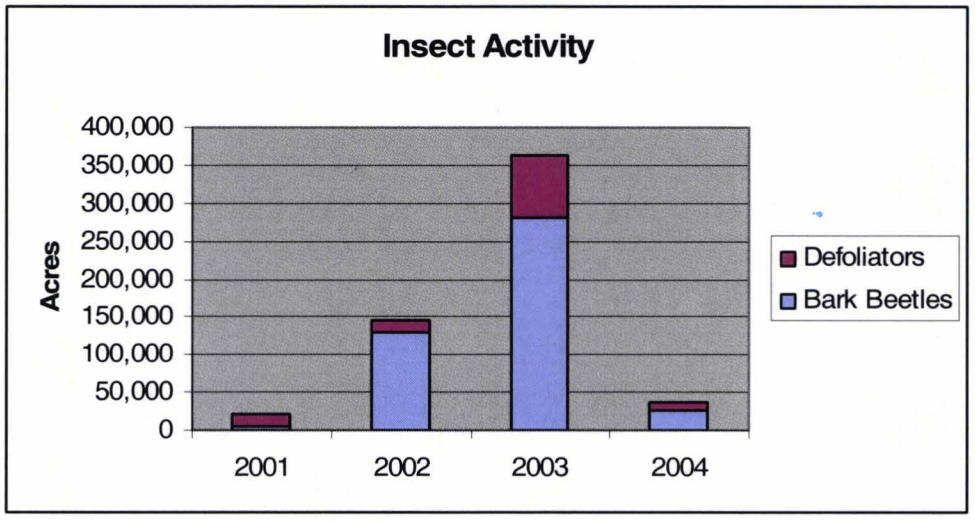


Figure 5. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2004).

Based on the information currently available **there appears to be an overall upward in late succession and mature ponderosa pine habitat** due to reduced harvest levels

and continuing strong forest growth. Endemic insect infestations are creating snags and down wood across many acres improving fungi availability for squirrels. There have been some recent losses of mature ponderosa pine due to wildfire but these losses are small on a forest-wide scale. Also some unburned suitable habitat remains well distributed within the burn area. The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

POPULATION TREND

Information from the Bison-M database indicates that this species is fairly common throughout New Mexico and Arizona (NMDGF 2001). Findley (1975) also describes Abert's squirrel to be widely distributed throughout its range. Figure 6 displays the species current distribution and conservation status. The NatureServe (2005) database (www.natureserve.org/explorer) documents that throughout its range, Abert's squirrel is listed as "G5", (i.e., globally secure and common, widespread and abundant). Reasons given for the G5 ranking are its large range and that it is common in many areas and there is no evidence of large-scale declines. It is not vulnerable in most of its range. Within the United States, the Abert's squirrel is listed as "N5" (i.e., secure and common, widespread and abundant).

Arizona

In Arizona the squirrel is listed as "S5" (i.e. secure) (NatureServe 2005).

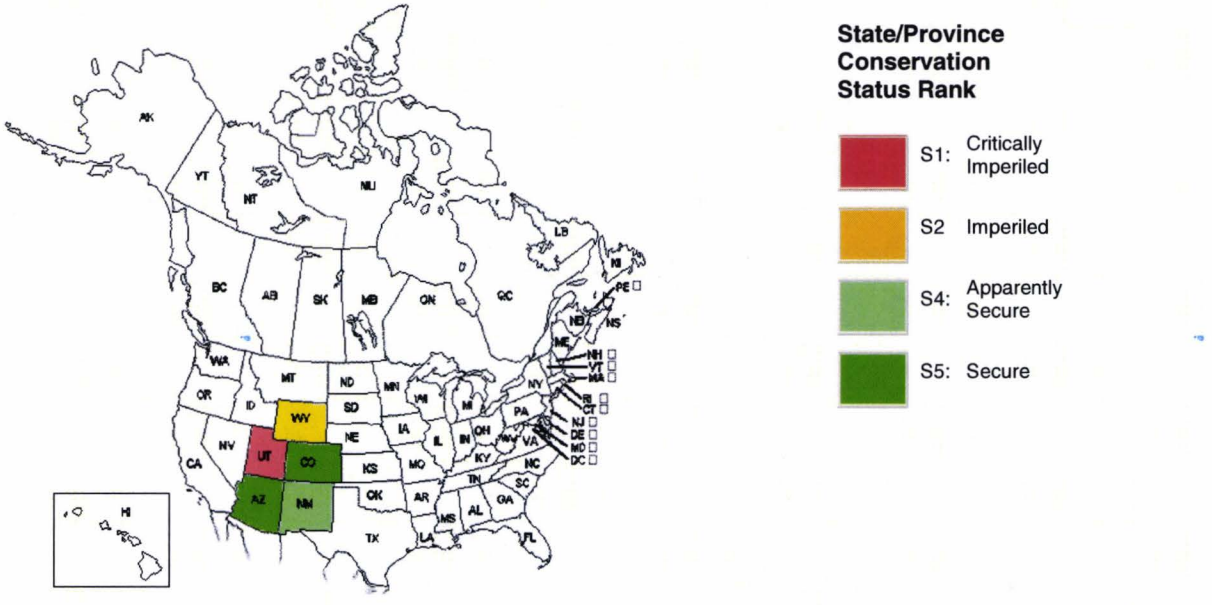


Figure 6. Distribution map of Abert's squirrel in North America displaying conservation status by state (Natureserve 2005).

Of the four squirrel species occurring in Arizona, Abert's squirrel is the most widespread and contributes most to the annual squirrel harvest (Arizona Game and Fish 2004). However, the numbers of tree squirrel hunters and harvest depends largely on the vagaries of Abert's squirrel populations making squirrel harvest a good indicator of population levels (see Figure 7).

Questionnaire data collected since the early 1960s show that the peak number of hunters was in 1986 when 21,402 squirrel hunters took to the field and bagged nearly 165,000 squirrels for a hunter success of 2.5 squirrels per day. Since 1990 the number of hunters has generally averaged between 12,000 and 18,000 a year with the average annual harvest being between 50,000 and 100,000 tree squirrels.

Available evidence suggests that populations of Abert's squirrels fluctuate both in the short- and long-term (Pearson 1950, Keith 1965, Farentinos 1972, Hall 1981), but there is in no danger of extinction (UM 1997). Factors causing these fluctuations are not clear. Population numbers of Abert's squirrel's appear to fluctuate widely over time and space. Population cycles may be related to cyclic variation in the biomass of the pine seed crops. Populations seem to fluctuate widely over time, caused by the amount of over-winter mortality, which is likely related to that fall's cone crop. A good and widespread mast crop brings an abundance of squirrels, whereas a year or so of scanty pine cone production results in a scarcity of these animals (Hoffmeister 1986). Brown (1984) reported densities of 15-30 per square mile (about 2 to 5 per 100 acres). Hoffmeister (1986) reported density ranged from a low of 1-2 per 100 acres in 1954 up to 12 per 100 acres in 1941 in an area near Flagstaff.

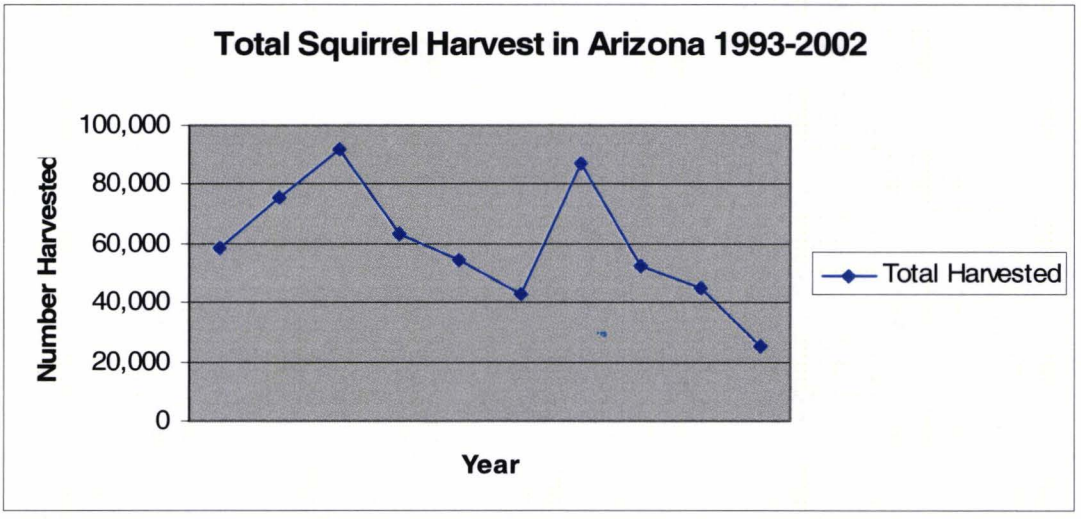


Figure 7. Squirrel population trend as evidenced by total squirrel harvest in Arizona from 1993-2003 (Arizona Game and Fish 2004).

Apache-Sitgreaves National Forest

On the Apache-Sitgreaves NF, the species ranges from fairly uncommon to common throughout the pine type. This is likely due to the presence of large areas of mid-seral habitat conditions rather than mature stands of ponderosa and in combination with less

than favorable weather conditions such as periodic drought. Surveys specific to Abert's squirrel population densities are currently being conducted on the Apache-Sitgreaves NF. Due to the extended drought conditions this data is likely to identify core populations.

Taking into account the continuing occurrence of the Abert's squirrel across the Forest in suitable habitat, the abundance and wide distribution of suitable habitats across the Forest, upward habitat trends for late succession habitat in the Forest, and the presence of a harvestable surplus in the Abert's squirrel population, it appears that the Forest supports well distributed, reproducing populations of this species. **Currently, Abert's squirrel populations in the Apache-Sitgreaves National Forest are considered to be stable, and likely somewhat below potential** due to less than ideal forest structure in ponderosa pine habitats and drought conditions**.**

Although the Abert's squirrel is probably an excellent selection for a management indicator species due to its dependence on specific habitat features of ponderosa pine forests and its role as a key prey species for rare forest raptors, it is **not** an indicator of early succession habitat. The Forest Plan should be modified to correctly identify the mature ponderosa pine habitat type this management indicator species truly represents.

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Cinnamon Teal (*Anas cyanoptera*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the cinnamon teal is an indicator species for wetlands (USDA 1987a, p.134). Cinnamon Teal (*Anas cyanoptera septentrionalium*) is a common migratory resident of wetlands and marshes throughout the western U.S. and Canada (Natureserve 2005) (see Figure 1). Brown (1985) considered Cinnamon Teal the most common nesting duck in Arizona, concentrated in wetland habitats above the Mogollon Rim on the San Francisco Plateau and in the White Mountains. In Arizona, most locally breeding Cinnamon Teal and their young are in the process of migration by the time the waterfowl hunting season opens in early October (Brown 1985).

Cinnamon teal generally begin nesting in very late spring and early summer in the Apache-Sitgreaves National Forests (Forests) (Fredrickson and Dugger, undated). During the breeding season, the species prefers small and shallow wetlands typically surrounded by grasses and herbaceous vegetation one to two feet in height. Cinnamon teal tend to select nest sites within about 75 to 100 yards from water in dense, upland vegetation that provides both horizontal and visual concealment of the nest. The species nests on islands when herbaceous cover provides excellent concealment for the nests. Nest cover may consist of a wide variety of plant species, including spikerush (*Eleocharis sp.*), western wheatgrass (*Agropyron smithii*), rabbitbrush (*Chrysothamnus sp.*), and foxtail barley (*Hordeum jubatum*). As with most ducks, foods selected vary seasonally and with the age of the individual. Aquatic invertebrates appear to be particularly important dietary components for females during the egg-laying period, and for ducklings. Seeds of various aquatic macrophytes are also consumed.

Management Activities or Natural Events That May Affect Habitat

Negative: Seasonal drought, draining of wetlands, grazing of wetlands/riparian vegetation, disturbance on nesting grounds from recreation, introduction of predatory non-native fish (Arizona Game and Fish 2004, Myers 1982).

Positive: Wetland habitat improvement projects, exclusion of livestock from wetlands/riparian habitats, elimination of non-native fish species.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), incudes specific "Standards and Guidelines" that are expected to maintain or improve wetlands in Management Areas 3 and 11 including:

Management Area 3 – Riparian

- Improve wetlands in accordance with the Forest Wetlands Management Plan (Adams and McKibben 1976).
- Improve wintering waterfowl habitat.

- Maintain or improve nesting cover in conjunction with construction of waterfowl nesting islands.
- Maintain and improve wetland habitat by planting waterfowl forage species on existing waterfowl islands and shorelines.
- Maintain or improve waterfowl nesting cover on existing waterfowl nesting islands and shorelines.
- Maintain riparian and meadow communities by providing waters for livestock and wildlife away from sensitive riparian areas.
- Establish exclosures to determine riparian vegetation potential on representative sites.

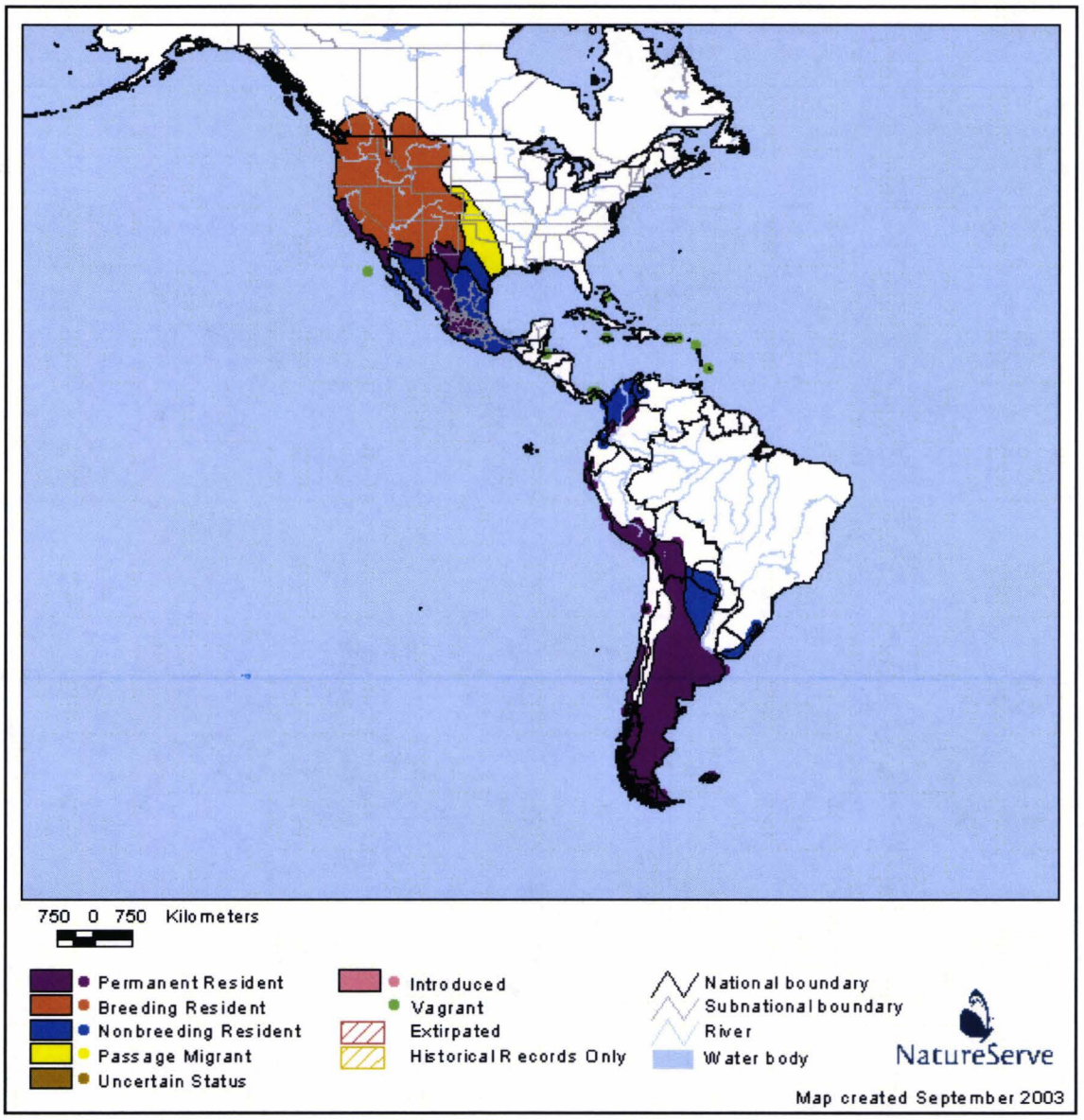

Figure 1. Range map for cinnamon teal from Natureserve 2005.

Management Area 11 – Wetlands

- Determine the need and then maintain and improve wetland habitat by planting waterfowl forage species along the shorelines in the first decade. Complete by 2010.

- Construct waterfowl islands, and create potholes in wetland areas to provide nesting habitat.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat features for which this species was selected as a management indicator species was wetlands. The Forest Plan EIS (USDA Forest Service 1987a) lists a total of 3,962 acres of open water. The current GIS database (USDA Forest Service 2005) shows 4,021 acres of water including lakes, reservoirs, and wetlands.

In the Forests, the number and condition of shallow wetlands (natural and augmented with dikes) typically reflect variations in the amount of snowmelt runoff (Piest 1981). Droughty conditions extending beyond a couple of years may result in many of these wetlands drying or becoming ephemeral. Some spring-fed wetlands (e.g. Sierra Blanca reservoir) and some larger, runoff-dependent reservoirs with extensive shallow-marsh zones (e.g. Luna Lake, Nelson Reservoir), also provide marshy wetland habitat (see Figure 2). Spring-fed wetlands, especially, may provide more dependable breeding wetland habitat. Other larger reservoirs that provide more dependable surface water (e.g. Big Lake, Crescent Lake, Black Canyon Lake, Willow Springs Lake, Woods Canyon Lake, Bear Canyon Lake, Chevelon Canyon Lake, and Show Low Lake) generally lack shallow-marsh habitats. These larger bodies of water are generally more important for post-breeding and migrant waterfowl than for breeding ducks. Most reservoirs support a minimal riparian zone or none at all because of fluctuating water levels.

Overuse of riparian areas including wetlands was identified as a public issue in the EIS. After the Forest Plan went into effect, the Forest developed a Fisheries and Riparian Habitat Implementation Plan (USDA Forest Service, no date) to address public concerns. At that time, the Forest estimated that 72% of the riparian areas were in unsatisfactory condition. The Forest has worked cooperatively with the towns of Show Low and Pinetop-Lakeside to create marshes from treated effluent (e.g. Pintail Lake complex, Jaques Marsh). Early in their existence (i.e., late-1970s, early-1980s), these marshes attracted ducks that especially utilized the created islands for nesting (L. Piest, pers. comm.).

Habitat capability has not been estimated for the species. Adams et al. (1976) believed that by eliminating impacts from livestock at "selected wetlands" on the Forest, waterfowl productivity could increase considerably in 20 years (i.e. by 1996). Although his sample size was very small, Piest (1981) estimated that densities of cinnamon teal nests were about four times greater in "ungrazed" uplands than in "grazed" uplands on the Forests (grazed or ungrazed by livestock). This might indicate that the habitat capability for nesting cinnamon teal at wetlands accessed by livestock was generally at about 25% of its potential.

Other wetland habitat improvement projects have been implemented on the Springerville and Alpine Ranger Districts (C. Denton and J. Copeland, Pers. comm). About eighty acres of wetlands at Nelson Reservoir were fenced in 2003 (See Figure 2). Another 112 acres were fenced at an administrative site on Alpine RD.

Figure 2. Nelson Reservoir has extensive wetlands and marshes at the south end.

In 2005 another 20-acre exclosure is planned at George's Lake. Dipping Vat Reservoir was pothole-blasted to create nesting islands and reseeded in 1988 (see Figure 3). A barbed-wire fence was constructed to exclude livestock grazing. Ducks Unlimited was a partner in the project. In conjunction with the Arizona Game and Fish Department and the Springerville Ranger District, the Antelope Foundation volunteered two workdays in 2004 to repair the fence. Recently the Springerville Ranger District worked with the Arizona Game and Fish Department and obtained a grant from Intermountain West Joint Venture for the maintenance and redevelopment of eleven wetland enhancement project sites.

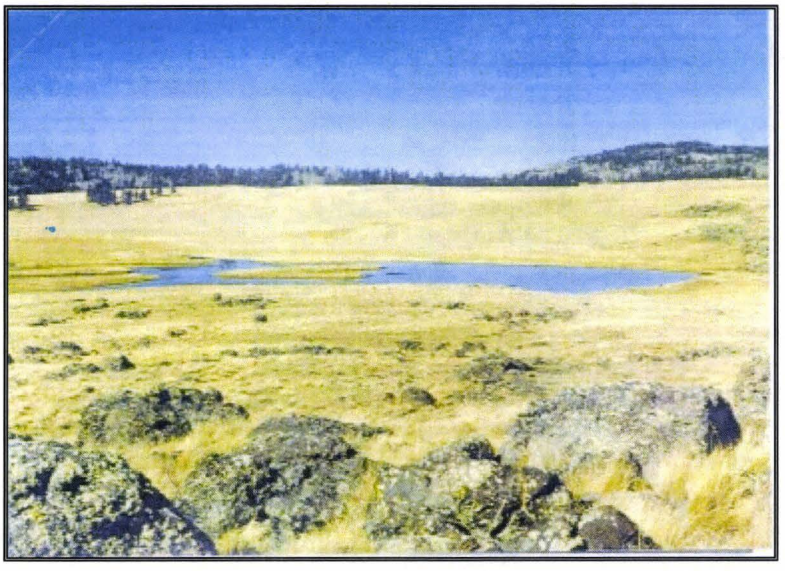

Figure 3. Dipping Vat Reservoir after habitat improvement showing nesting islands and wetland vegetation.

Based on available information, **wetland habitat quality in the Forests ranges from good to poor condition with an upward trend due to habitat protection projects.** Poor conditions are due to livestock use in some instances, but more commonly, it is due to the fluctuating nature of water levels in wetland areas and dependence on rainfall. **The amount of wetland habitat appears stable.**

POPULATION TREND

Although the cinnamon teal, as with most waterfowl, exhibit wide fluctuations in breeding numbers from year-to-year, the species is considered secure throughout its range (Heritage Global Status: G5; National Status Rank: N5; Arizona Status Rank: S5) (NatureServe Explorer 2005). Overall, the US population of cinnamon teal is stable (-1.09, p=0.07547, n=213) (Sauer et al. 2004).

The Global Heritage Status for cinnamon teal is G5 (i.e., globally secure and common, widespread, and abundant) across its range. It has a fairly large range in the western United States and is common in many areas; although it is considered rare at the periphery of its range (Figure 4). In the United States, breeding cinnamon teal populations are ranked N5 (secure); nonbreeders are not ranked. The Arizona Heritage status for the cinnamon teal is S5 (i.e., secure, common, widespread and abundant) (Nature Serve Explorer 2005). Figure 5 displays population trend data for the species across its range.

Arizona

Sauer et al. (2004) report between 1966 and 2003 there was no significant population trend (-12.52, p=0.31279, n=4) for the cinnamon teal in Arizona (see Figure 6). However, this trend estimate is based on observations on only four routes with an average of 0.25 teal seen per route. Analysis of data from Arizona between the years 1980 and 2003, detected a downward trend in breeding cinnamon teal populations (-9.22%, p=0.00461) based on two routes with an average of 0.58 teal being observed on each route. These trend estimates are based on extremely small sample size and should not be considered accurate.

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The cinnamon teal was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). The Arizona Partners in Flight did not list a statewide population objective for the teal. The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort did not identify the cinnamon teal as a species of concern in this region.

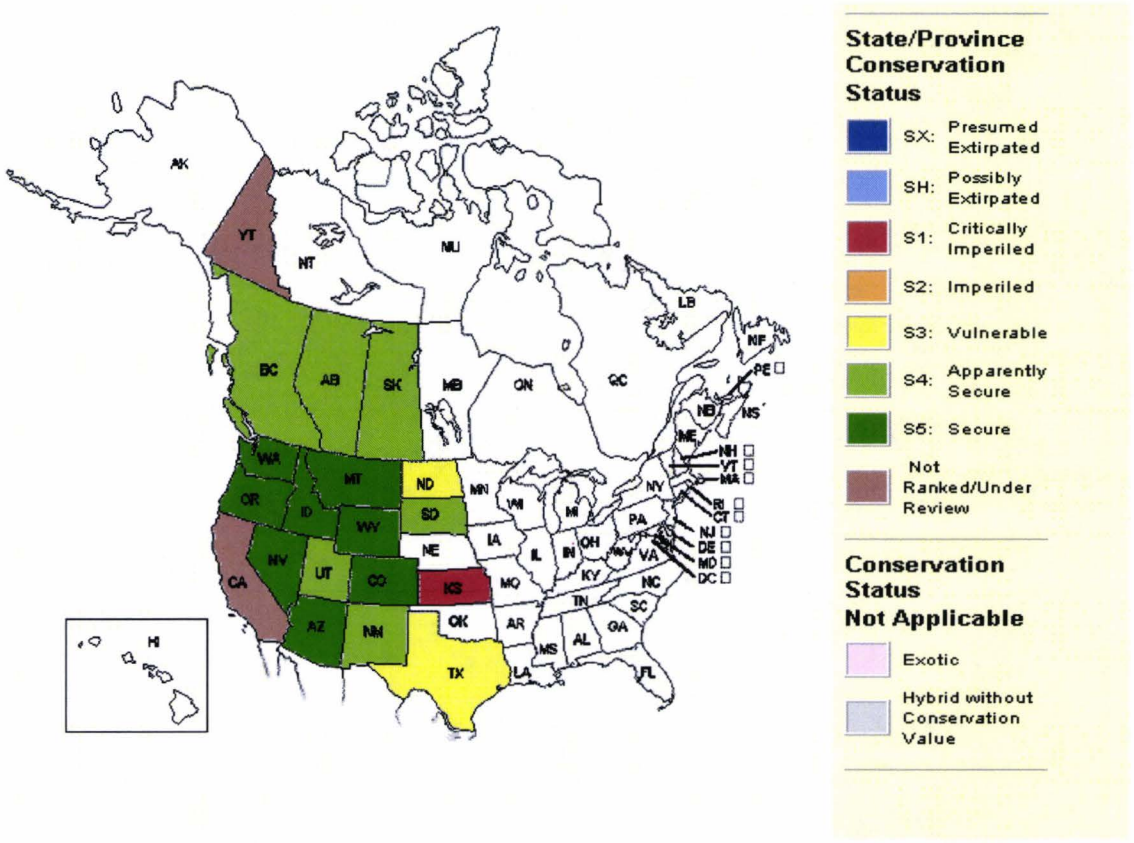

Figure 4. Distribution map of cinnamon teal in North America displaying conservation status by state (Natureserve 2005).

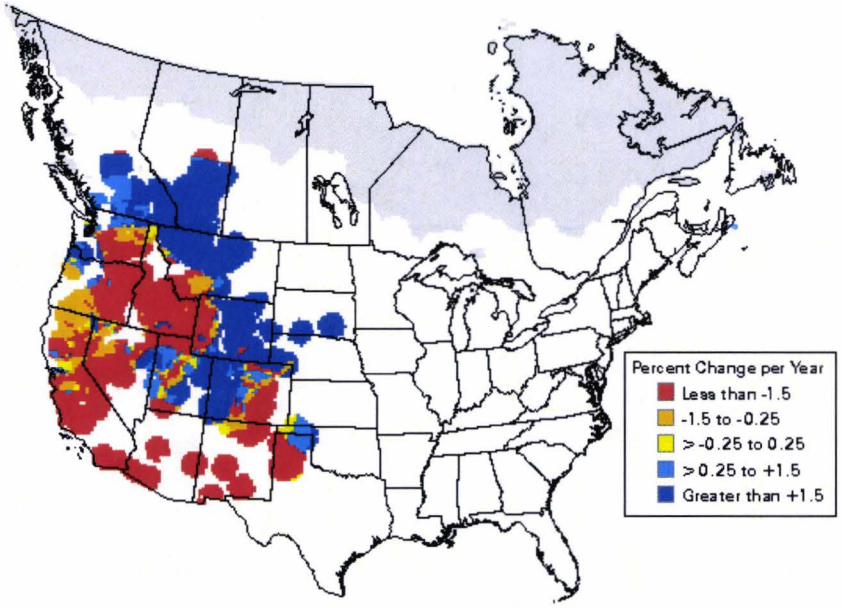

Figure 5. Breeding Bird Survey population trend map for the cinnamon teal from 1966-2003 (Sauer et al. 2004)

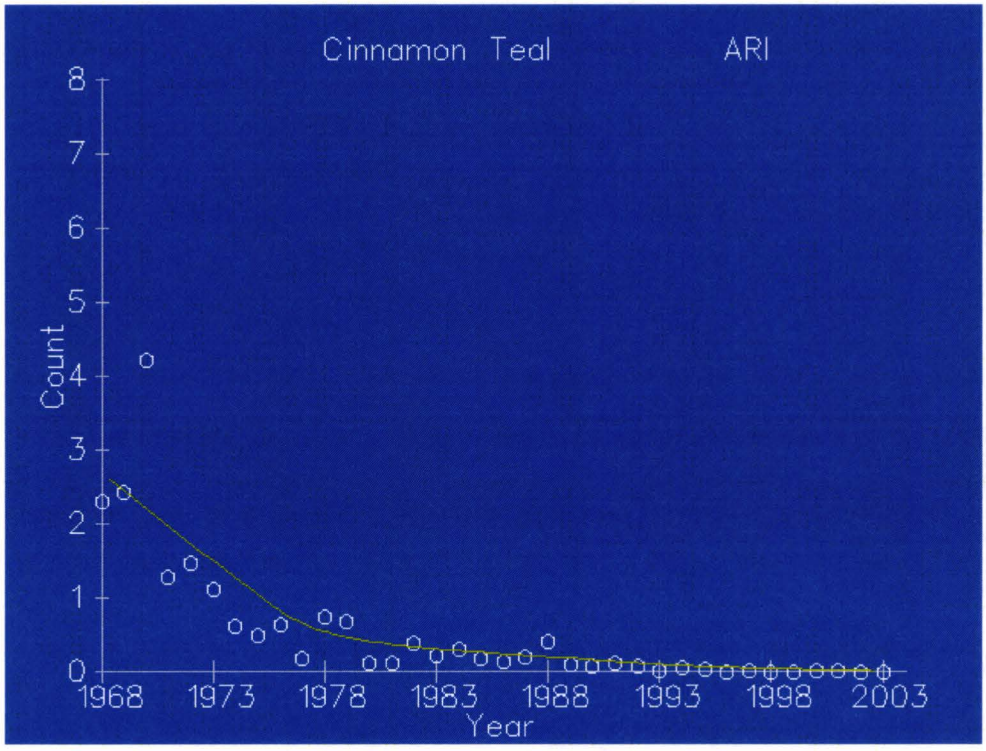

Figure 6. Population trend data for cinnamon teal in Arizona from Breeding Bird Survey data 1966-2003 (Sauer et al. 2004)

Apache-Sitgreaves National Forest

The cinnamon teal is considered a common permanent resident of the Apache-Sitgreaves NF (USDA Forest Service 1996), and a fairly common summer resident on the adjacent Gila NF (USDA Forest Service 1997).

The Arizona Game and Fish Department surveyed a portion (e.g. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Forests. Of these, 65 sectors occurred on the Forests. Breeding cinnamon teal were detected at least once in 11 of these sectors across the Forests from 1993 to 2000 (Figure 7). Habitat information provided for each observation is very general, documenting that the cinnamon teal were associated with marshlands or wetlands.

Five BBS routes are represented on the Forests (National Atlas of the United States 2002). The results of these routes individually or collectively cannot be used to estimate trends of breeding cinnamon teal on the Forests. Cinnamon teal were only detected on one of the five routes. Their presence on this route (Alpine) likely reflects the presence of Luna Lake and/or Sierra Blanca reservoirs along the route. An average of 8.67 teal has been recorded on this route since 1992. The data documents the presence of breeding cinnamon teal on the Forests through 2003.

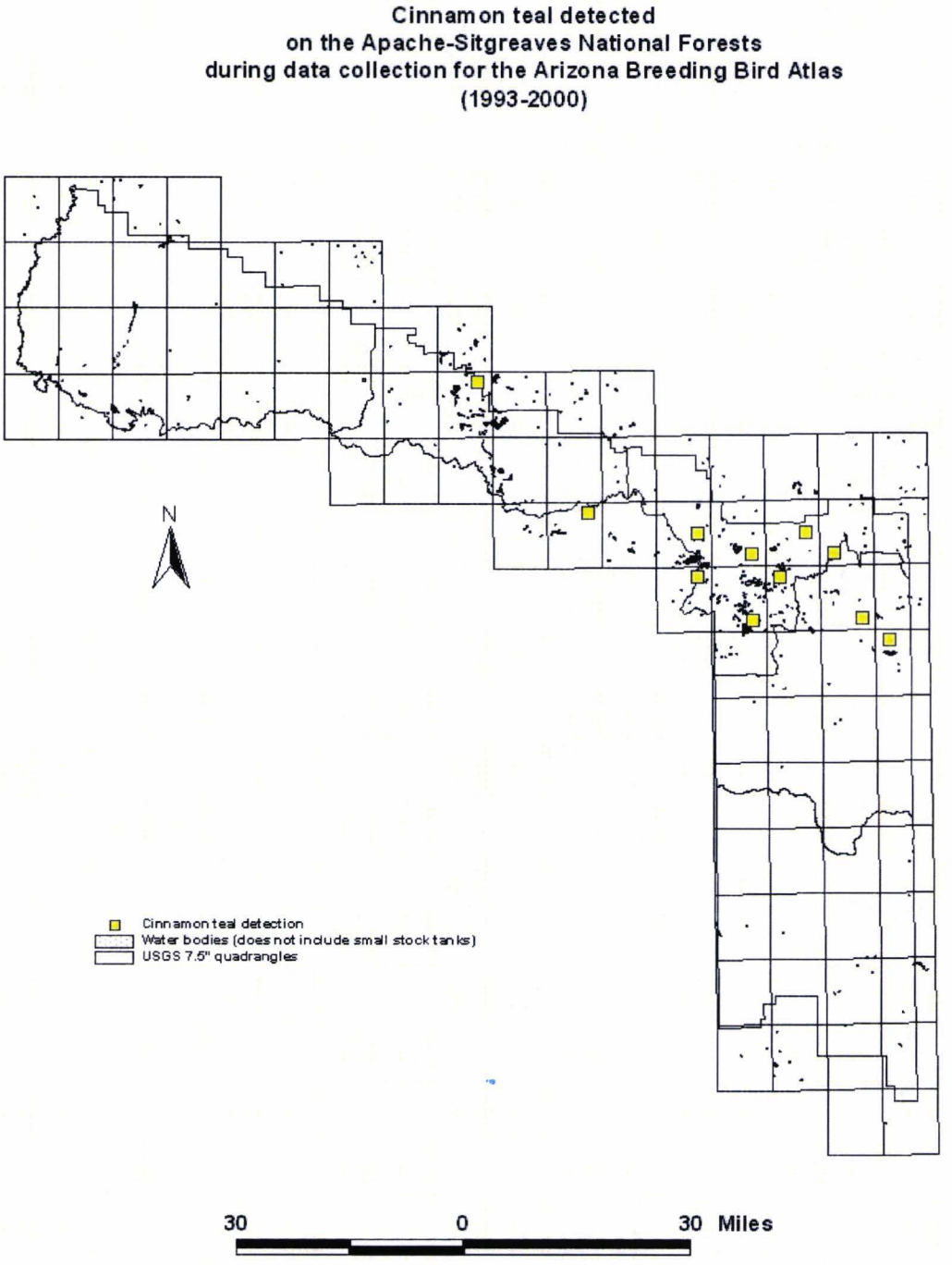

Figure 7. Distribution of cinnamon teal detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of water bodies.

Arizona Game and Fish and the U.S. Fish and Wildlife Service are the regulatory agencies responsible for managing harvestable waterfowl species. Both agencies allow

hunting of cinnamon teal in the Apache-Sitgreaves NF. Reports from the U.S. Fish and Wildlife Service were reviewed for information with which to compare the BBS information (Wilkins and Otto 2002, USFWS 2002). Unfortunately, the documents do not discuss cinnamon teal specifically at a continental scale, much less at the Arizona level. The documents do indicate that breeding populations of waterfowl often exhibit enormous fluctuations over short timeframes in response to environmental factors, but that over long periods of time, no general trend may be evident. For example, Wilkins and Otto (2002) reported that breeding populations of blue-winged teal in 2002 were 27% below those in 2001 ($p<0.001$) but unchanged from the 1955-2001 average ($p=0.22$). It is likely that breeding cinnamon teal also show wide variation in numbers in the Forests in response to variation in winter precipitation and subsequent habitat availability.

Arizona Game and Fish lists "the natural and modified marshes found above the Mogollon Rim and in the White Mountains" as Arizona's principal waterfowl nesting grounds (Arizona Game and Fish 2004). Cinnamon teal are considered one of the state's "big five" nesting duck species. The State uses the results of the annual waterfowl hunt questionnaire to estimate duck harvest. Harvest levels fluctuate with population levels and have been quite sporadic in Arizona. Estimates of harvest range from more than 150,000 ducks in 1979-80 to less than 18,000 ducks in 1990-91. The average annual take during the past three years (2001-04) has been more than 50,000 birds (Arizona Game and Fish 2004). Population levels are believed to vary from year to year based on winter precipitation.

Taking into account the continuing occurrence of the cinnamon teal across the Forest in suitable wetland habitat, the status of the species as game species, the upward trend for wetland habitat in the Forest, and a stable but variable population trend, it appears that the Forest supports a reproducing population of this species. **Currently, cinnamon teal populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely below potential** due to impacts of livestock grazing, recreation, and drought.

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Elk (*Cervus elaphus*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the elk is an indicator species for early-succession habitat (USDA 1987a, p.134). More specifically, the plan (pg. 120) identifies elk as management indicator species for Management Area, "Forested Land", that included 836,288 acres of ponderosa pine, Douglas fir, mixed-conifer, spruce-fir, and aspen. Elk (*Cervus elaphus*) are widely distributed migratory generalists that use a broad range of habitat types on a seasonal basis. Mountain meadows, ponderosa pine woodlands, spruce-fir forests, and other high-elevation habitat between 7,000 and 10,500 feet constitute the elk's principal summer range. Elk tend to stay on summer range as long as possible arriving early and remaining until forced down by deep snow. Their winter range, usually pinyon-juniper habitat between 5,500 and 6,500 feet elevation, is more limited in extent and may only comprise 10% of the animal's total habitat. The preferred foods of elk are grasses, sedges, and such other plants as aster, goosefoot, bear grass, erigonums, lupines, and other mountain plants (Hoffmeister 1986). Browse items such as serviceberry, mountain mahogany, sagebrush, rabbitbrush, acorns, and leaves of oaks, snowberry, and willows may be favored by elk at some times of the year.

In Arizona, elks can be found in forested areas across the Mogollon Rim from the south rim of the Grand Canyon to the New Mexico Border as shown in Figure 1.

Figure 1. Distribution of elk in Arizona (Arizona Game and Fish 2004).

Management Activities or Natural Events That May Affect Habitat

Negative: Urban development, agricultural development (Boyd and Cooperrider 1986), fire suppression.

Positive: Wildfire, prescribed fire, and vegetation management activities that create openings in forested landscapes.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

In the Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), includes specific "Standards and Guidelines" that are expected to maintain or improve elk habitat components in timberland, woodlands, riparian areas, and grasslands including:

- Use integrated resource management in design of timber harvests to create habitat conditions needed by a variety of wildlife species in a cost effective manner (revised per Amendment 1).
- Where appropriate, apply prescribed fire to improve big game forage.
- Provide big game, non-game, and upland game habitat in aspen.
- Manage to provide a variety of stand sizes, shapes, crown closure, edge contrast, age structure, and interspersion.
- Amendment 1 – Special considerations will be given to critical big game winter ranges in areas where big game winter range has been determined to be a limiting factor in achieving big game objectives. In those areas, no new year-round grazing or new winter grazing by domestic livestock will be allowed unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – New land acquisitions in these critical winter ranges will not be used for domestic livestock grazing unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – Total road densities should average 3.5 miles/square mile or less. Open road densities should average 2.0 miles/square mile or less.

MANAGEMENT AREA 1 - TIMBERLAND

- Provide big game, non-game, and upland game habitat in aspen.
- Thermal cover for elk is a stand of coniferous forest tall and wide enough to allow animal movement and bedding with a high degree of crown closure. Emphasize maintaining thermal cover in known travelways and bedding areas.
- Hiding cover is vegetation and topographical features capable of hiding 90 percent of a standing deer or elk from human view at a distance of 200 feet or less. Emphasize maintaining hiding cover adjacent to dependable water and key openings, along known travelways, and in pine stringers.
- Protect and manage to include hiding and thermal cover and defer logging activities from May 15 to June 30 in known fawning and calving areas. This restriction may be lifted if on-the-ground inspection indicates that the area is not

being used for fawning/calving and other areas adjacent to the sale area are available for wildlife needs.

- In key big game habitat, manage for at least 30 percent of the mixed conifer to meet hiding cover needs. Give priority for cover management in drainage bottoms, heads of drainages, and isolated pockets of mixed conifer. Defer logging in these areas from April 15 to June 30.
- Amendment 1 - On replacement page 124-1 of the FLMP there is a table, which provides specific direction on basal area and growing stock levels, which experience has shown fully meet hiding and thermal cover requirements in even age ponderosa pine and mixed conifer when there are no cover effects from topographic features or other species.

MANAGEMENT AREA 2 - WOODLAND

- Maintain or improve big game habitat. Limit created openings on big game winter range to no wider than 1,200 feet. Leave cover strips at least 500 feet wide between openings; openings are not to exceed 40 acres. Maintain no less than the current level of openings on current antelope ranges. Emphasize openings adjacent to pine stringers.
- Manage areas that are harvested for fuelwood. Emphasize openings on existing and potential big game range. Retain thermal cover and hiding cover on north and east exposures. Manage fuelwood sales to break up large areas of single-age classes. Leave cavity excavated trees, shrubs, and oak in openings created for wildlife.
- Retain ponderosa pine stringers as inclusions.
- Areas needing additional forage for elk are given first priority in scheduling firewood/wildlife habitat treatments. Treatments are usually done in acres remote from major disturbance.
- Mange for hiding cover and thermal cover in known fawning and calving areas.
- Defer firewood activities from May 15 to June 30 in known fawning and calving areas.
- Manage for at least 20 percent of each diversity unit in thermal and hiding cover. Emphasize cover management in travelways, bedding areas, reproductive areas, and adjacent to key openings. Cover is managed to provide at least 60% crown cover and at least 500' wide.

MANAGEMENT AREA 4 – GRASSLANDS

- Evaluate need, maintain, and improve meadows by eliminating competing conifers, stabilizing gullies to restore water tables, and reseeding with species desirable to wildlife.
- Evaluate need and construct fences where necessary to protect key meadows and riparian areas from grazing.

- When springs are developed in meadow communities, riparian areas, or other sensitive areas, protect these areas by piping the water to water developments in adjacent, less sensitive areas.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was early-succession habitat. The Forest Plan EIS did not define or describe early succession habitat with regard to MIS. Early succession generally refers to forested habitats in the non-stocked or seedling/sapling stages of regeneration. But several of the Forest's MIS also use mountain grasslands in similar ways as early-succession forests. Both grasslands and early-succession forests are affected in like ways by forest management activities. For the purposes of this discussion, both of these habitat types will be considered early-succession habitat.

The Forest Plan EIS shows a total of 145,428 acres of timber in age class 1-40 years old (USDA Forest Service 1987b, p. 150). This age group represents non-stocked stands (VSS1) and seedling/sapling stands (VSS2). In addition, there were 252,660 acres of mountain and prairie grasslands. Combined, these habitat types totaled 19.8% of the Apache-Sitgreaves NF. In 1996, based on Forest Inventory Assessment (FIA) data there were about 244,781 acres of grasslands and 138,786 acres of non-stocked and seedling/sapling stands, totaling 383,567 acres or about 19% of the Forest. These figures are displayed in Figure 4.

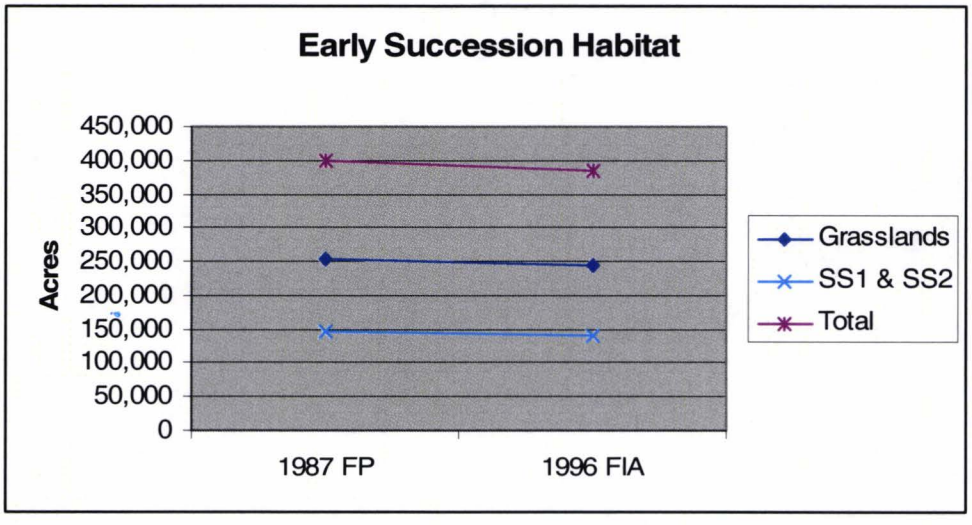


Figure 2. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-1996)

The "Habitat Quality Index Model" (version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for the mule deer. The Forest Plan identified elk as management indicator species for forested lands that included 836,288 acres of ponderosa pine, Douglas fir,

mixed-conifer, spruce-fir, and aspen; for grasslands that included 243,126 acres of mountain grasslands, desert, and prairie grasslands; and for woodland that included 611,025 acres of pinon-juniper with grassland understory. This totals to about 1,690,439 acres of suitable habitat. Based on the 1996 Forest Inventory Assessment (FIA) data (USDA Forest Service 2003a) for those same habitat types, there was approximately 1,882,787 acres of suitable elk habitat on the Forest. The Habitat Quality Indices generated from the 1996 FIA data estimate that forage habitat on the Forest is at about 50% of its capability, and cover habitat is at about 60% of its capability.

Both wildfire and timber harvest can also affect the amount of early-succession habitat. Timber harvest, especially clearcuts, can create early-succession habitat. However, most timber harvest opens stands and encourages growth of herbaceous vegetation, a change that improves elk habitat. The Forest Plan EIS considered effects to early succession in developing the Allowable Sale Quantity authorized under each alternative. The Forest Plan authorized about 18,000 acres of timber harvest annually. Figure 3 below depicts the levels of projected versus actual timber harvest over the life of the Forest Plan. Actual harvest information is from Forest records (Beal unpub. data). The projected harvest is based on the figure listed in the Forest Plan EIS for Alternative D of 18,080 acres annually (USDA Forest Service 1987b, p. 199). Actual harvest has varied considerably between years but has been declining overall as shown by the trend line in the graph below. The recent spike in timber harvest was due primarily to salvage harvest in the Rodeo-Chediski fire. The fire itself rather than harvest created an increase in early succession habitat as discussed below.

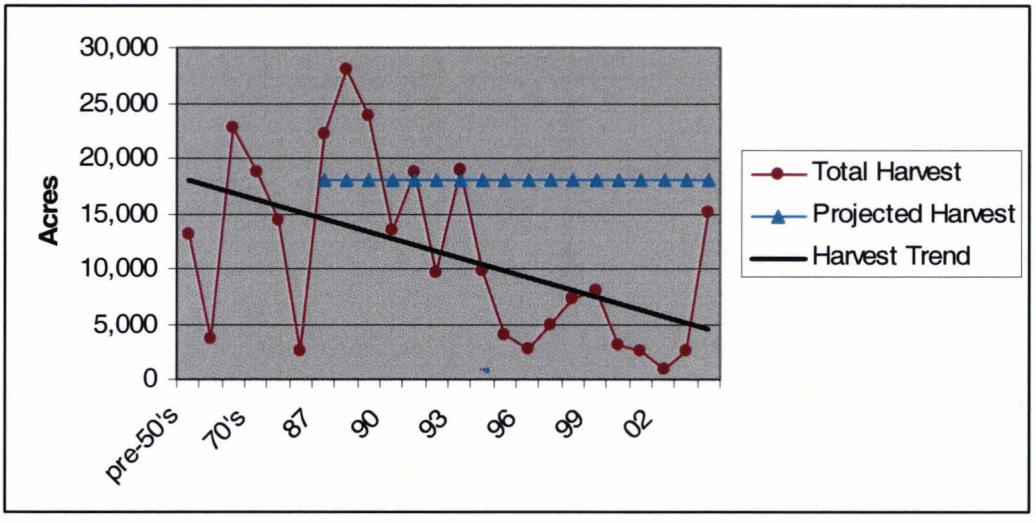


Figure 3. Actual vs. projected timber harvest in the Apache-Sitgreaves NF (1950-2004)

Wildfire has much greater potential to create early-succession habitat. Such was the case with the Rodeo-Chediski fire of 2002. The fire burned over 173,000 acres, converting 55% of that area back to early-succession habitat (USDA Forest Service 2003b). Figure 4 shows the changes to early-succession habitat in the Forest by 2004 due to the Rodeo-Chediski fire. Forage and hiding cover declined after the fire for big game species such as elk. On most forested ranges fire enhances grass/forb growth and shrubs such as *Ceanthus spp.*, mountain mahogany and other hardwood species. Thus

low intensity fire is considered desirable for elk habitat (Grifantini, 1991). Deer will use areas closer to cover. Most (54%) of the moderate to high-density deer habitat in the Rodeo-Chediski fire area burned under low intensity fire benefiting elk. The remaining 46% of the high-density big game habitat burned under moderate to high severity conditions. Habitat that burned under moderate to high severity will have little or no habitat value in the short-term (1-5 years) because grass and forbs are very sparse. Thus the forage capacity for elk has declined in the short-term compared to pre-fire conditions (USDA Forest Service 2003b). Long-term these areas could provide high quality forage for elk.

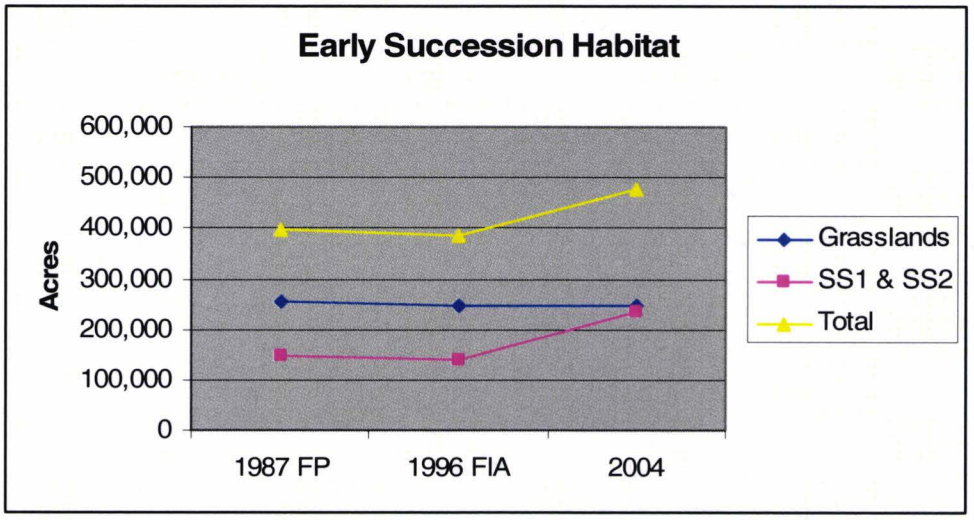


Figure 4. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-2004).

Early-succession habitat is by definition a transitory state except in grassland communities. Non-stocked stands and seedling/sapling areas eventually grow back into forested stands. The vast majority of the early-succession stands in the forest are in ponderosa pine, pinyon-juniper and juniper habitat types. As displayed in Figure 2, these habitat types show large net growths indicating that early-succession areas have the potential to quickly grow into later succession stages. However, the early-succession habitat created by the Rodeo-Chediski fire may be an exception. Many of the burned areas are very large and are not expected to become reestablished with trees for many years, possibly even centuries (USDA Forest Service 2003b). These areas may persist as early-succession habitat for a very long time.

Grasslands are another component of early-succession habitat. The amount of grasslands habitat in the Forest has remained stable over the life of the plan (see Figure 4). The condition of these grasslands is well described in White 2003. Generally speaking, all of the grasslands have been adversely impacted by livestock grazing dating from the late 1800s. Many of the grasslands were originally dominated by native cool-season bunchgrasses that are not tolerant of grazing. Prior to the arrival of the livestock industry, the only large animals to graze these grasslands were pronghorn antelope. It took only 10-15 years of heavy grazing by cattle near the end of the last

century to extensively alter these ecosystems (White 2003). As a result, most of the grasslands in the Forest are in poor ecological condition due to loss of native grasses, reduced plant diversity, decreased litter cover, and increased soil erosion. While the Forest has regularly decreased the numbers of permitted livestock, a burgeoning elk herd has replaced cattle with similar adverse effects. Thus, the ecological trend in the grasslands has been stable but the grasslands continue to remain well below potential in quality.

Based on the information currently available **there appears to be an upward trend in the amount of early-succession habitat** due primarily to the effects of wildfire. **The trend in the quality of early-succession habitat appears to be stable but grasslands are generally in poor condition** and well below potential.

POPULATION TREND

Elk are a wide-ranging species in North America (see Figure 5) (Natureserve 2005). Throughout its range, the species is considered secure (Heritage Global Status: G5; National Status Rank: N5; Arizona Status Rank: S5) (NatureServe Explorer 2005).

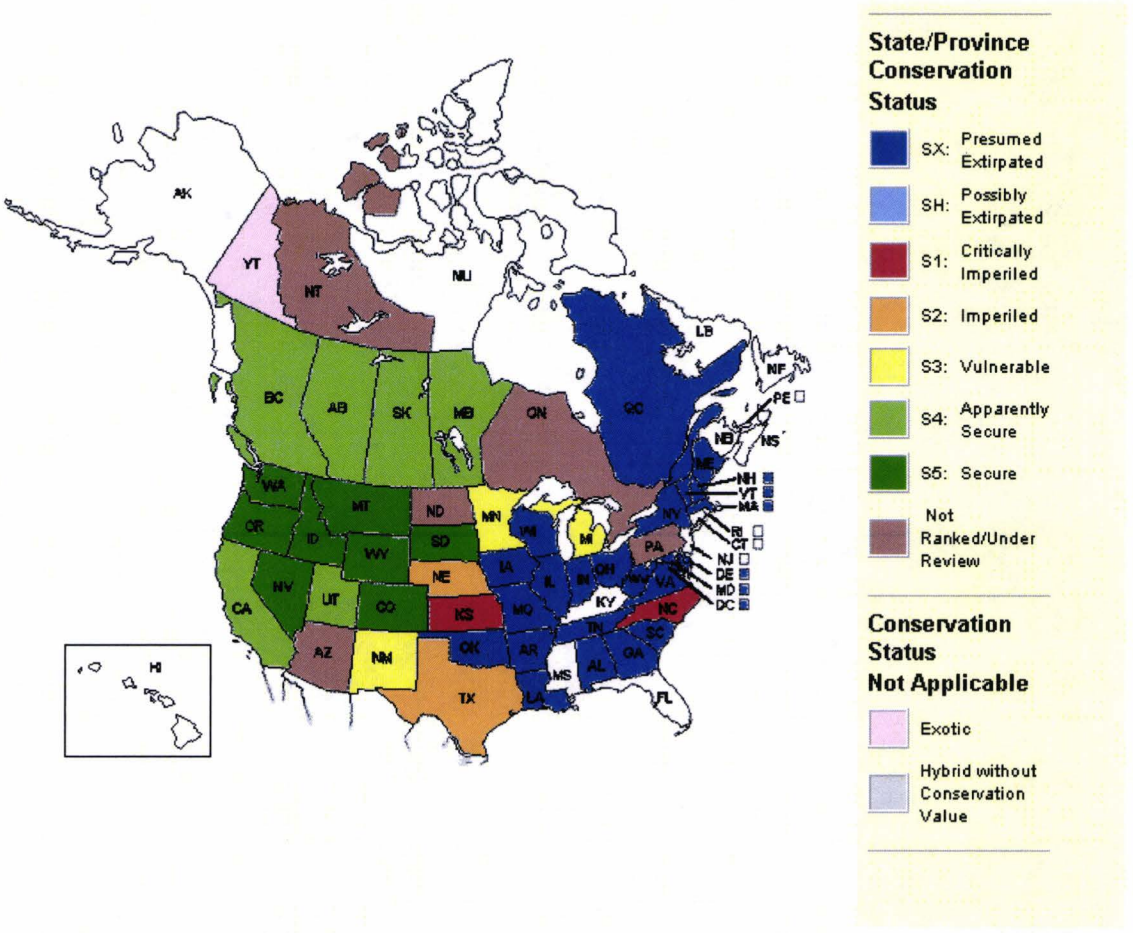


Figure 5. Distribution map of elk in North America displaying conservation status by state (Natureserve 2005).

Arizona

Elk were at one time thinly distributed in Arizona from the White and Blue Mountains westward along the Mogollon Rim to near the San Francisco Peaks. These native elk, Merriam's elk (Cervus elaphus merriami), were eliminated in Arizona shortly before or after 1900. Rocky Mountain elk (Cervus elaphus nelsoni) from Yellowstone National Park were first transplanted into Arizona on the western portion of the Sitgreaves National Forest in 1913. Private conservationists released 83 elk into Cabin Draw near Chevelon Creek. These and two other transplants in the 1920s – one south of Alpine, and another north of Williams- were highly successful. Arizona's elk population has now grown to approximately 26,000 post-hunt adults. Figure 6 show the elk population trend since the Forest Plan was approve based on Arizona Game and Fish survey information.

Apache-Sitgreaves National Forest

The elk is considered a common, permanent resident of the Apache-Sitgreaves NF. Elk are known to occur throughout the Forests. Information provided by the Arizona Game and Fish Department indicates about 1,757,396 acres of elk summer range and 1,228,615 acres of winter range on the Forest (Figures 7 and 8). Arizona Game and Fish Department manages the state's elk population through annual hunting permits issued for each hunt unit. Elk hunt units that are wholly or partially located within the Forests are Units 01, 03A, 03B, 03C, 04A, 04B, and 27. Harvest data and survey data for these units are displayed in Figures 9 and 10 below. These data show a stable to slightly decreasing trend in elk harvest in the Apache-Sitgreaves NF. Survey data appears to show a similar trend.

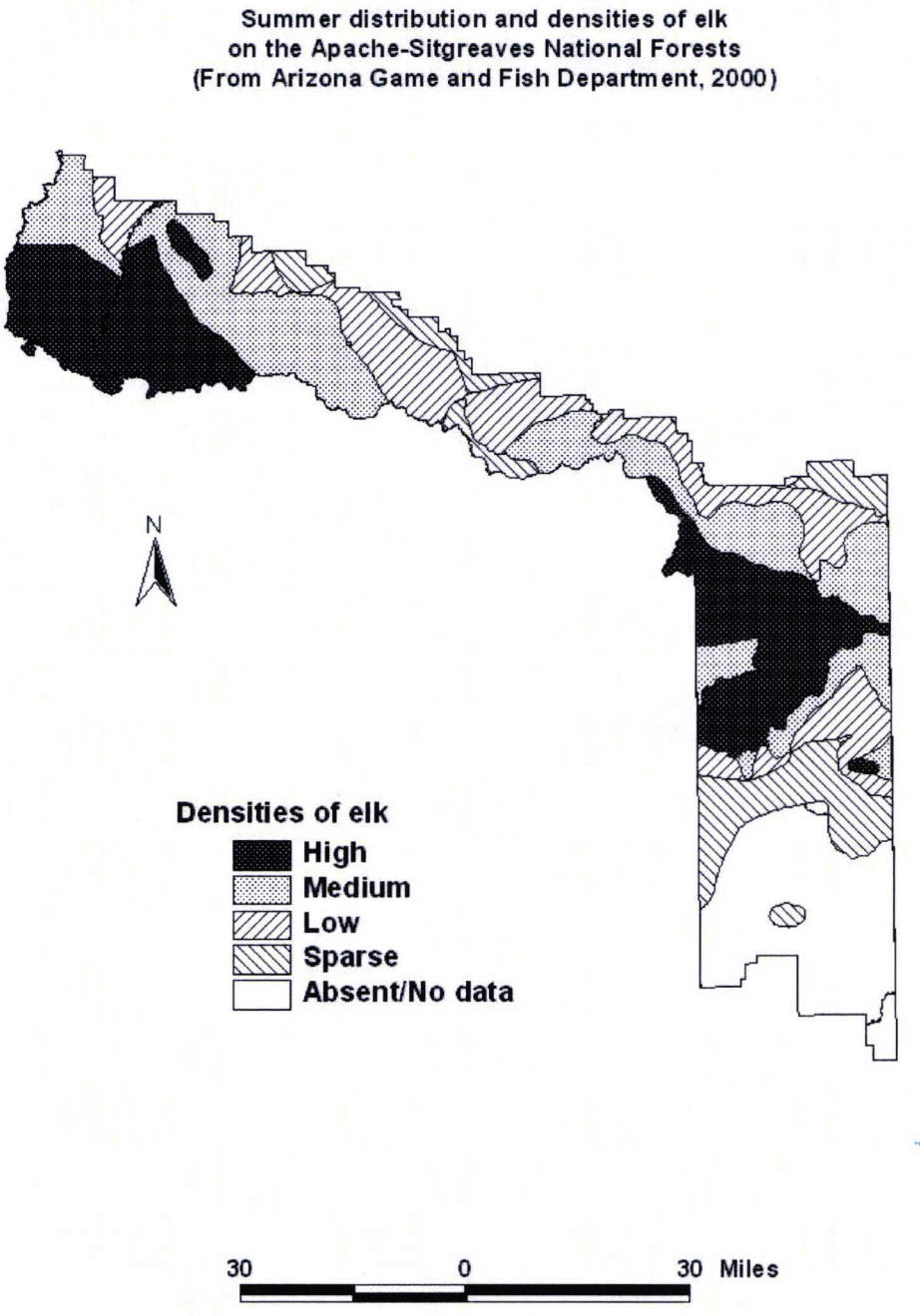


Figure 6. Map of elk distribution and abundance during summer on Apache-Sitgreaves NF.

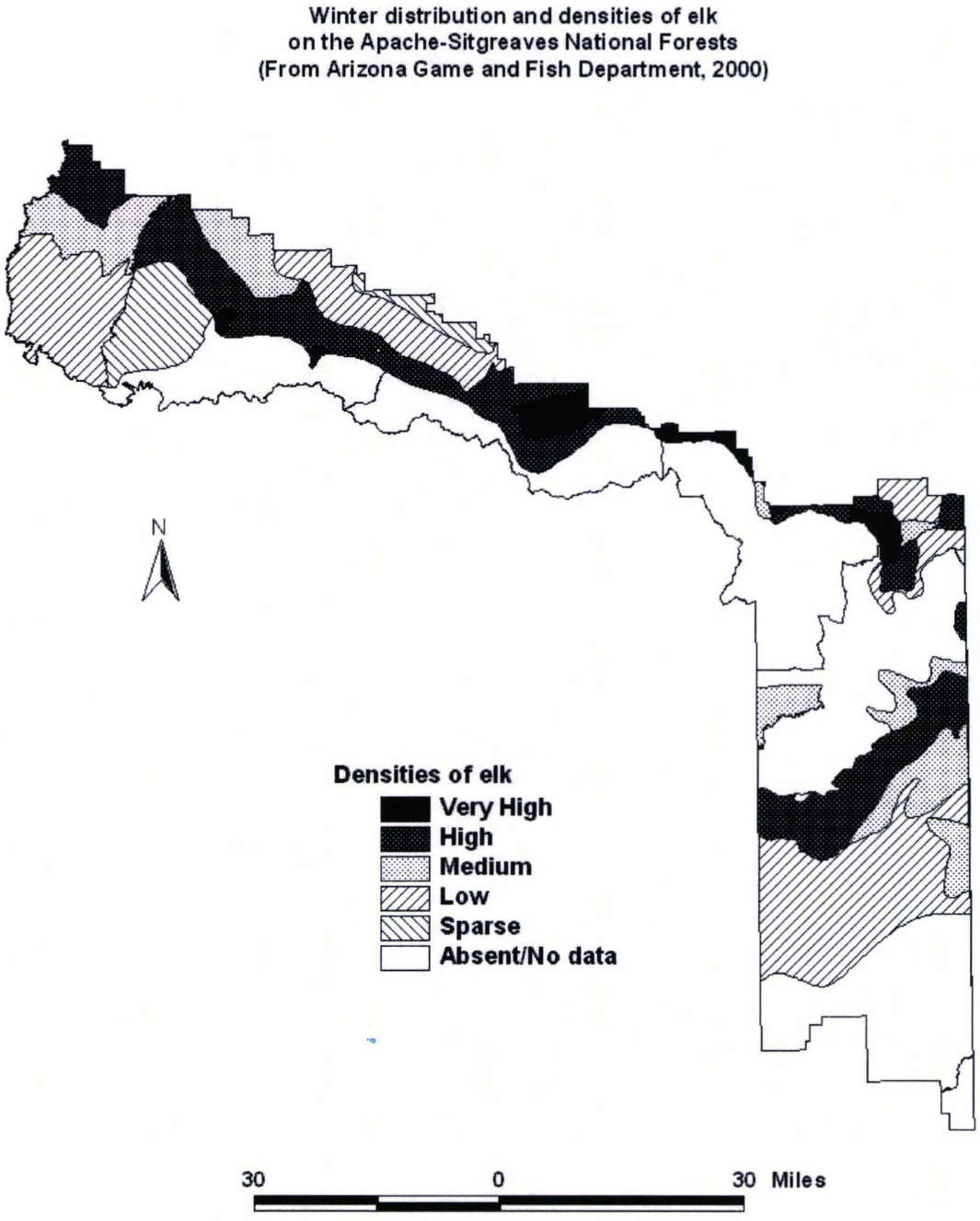
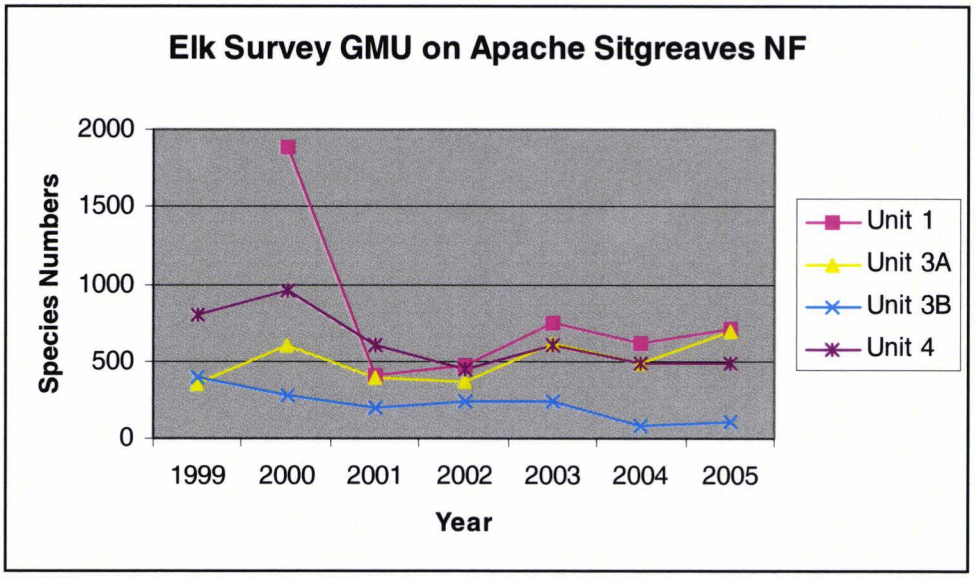
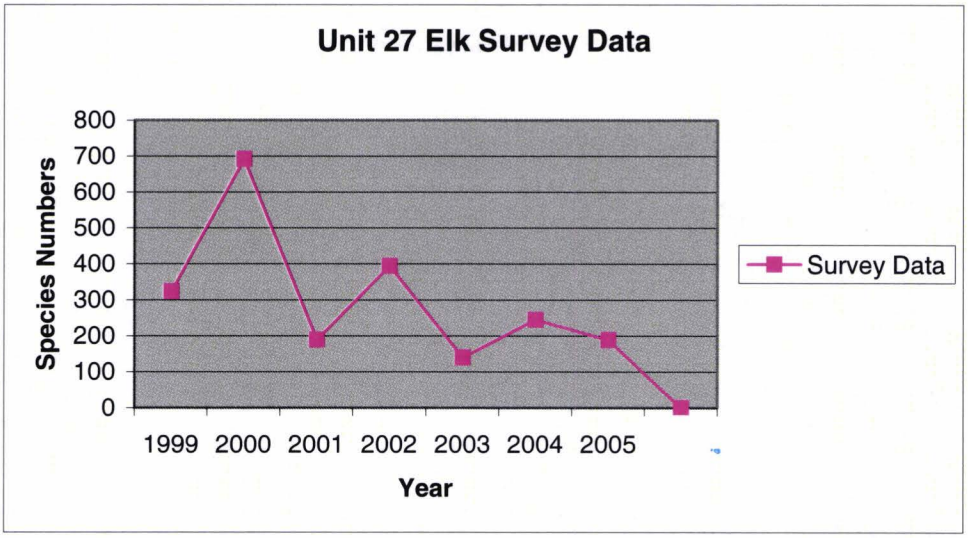
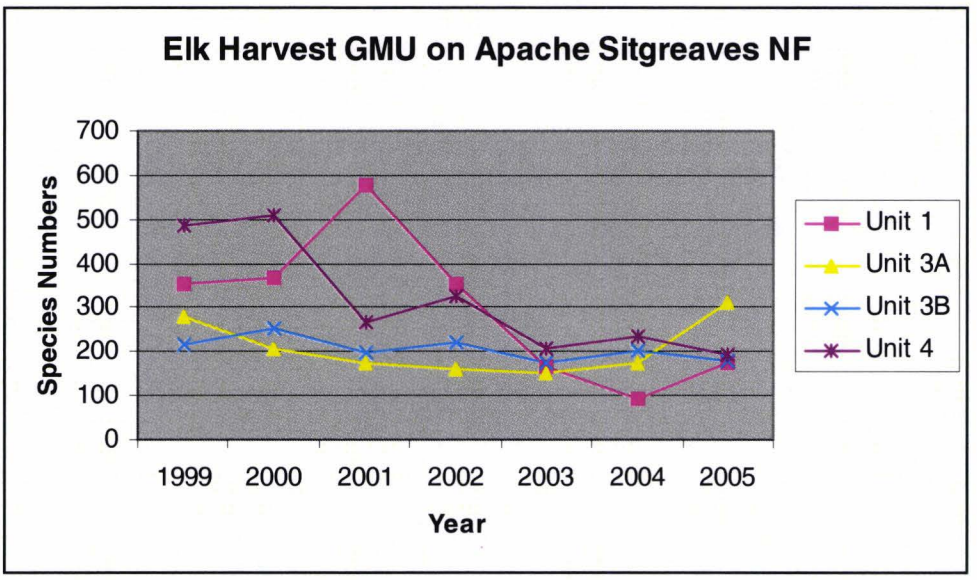


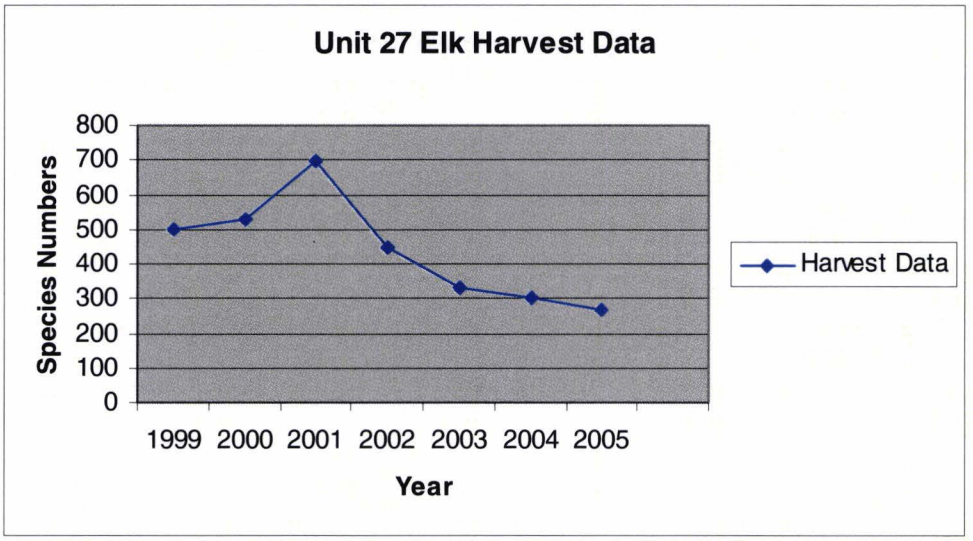
Figure 7. Map of elk distribution and abundance during winter on Apache-Sitgreaves NF.

Figure 8. Estimated population trend for the elk in Arizona based on survey and harvest data (Arizona Game and Fish 2005).






Elk Harvest GMU on Apache Sitgreaves NF
Species Numbers
700
600
500
400
300
200
100
0
1999
2000
2001
2002
2003
2004
2005
Year
Unit 1
Unit 3A
Unit 3B
Unit 4


Unit 27 Elk Harvest Data
Species Numbers
800
700
600
500
400
300
200
100
0
1999
2000
2001
2002
2003
2004
2005
Year
Harvest Data

Since the Forest Plan was developed, elk have expanded their distribution and numbers across the Forest. Based on survey and harvest information Arizona Game and Fish Department identified the following objectives for each Management Unit (Dave Cagle, Region I AGFD, April 4, 2002):

Unit 1, and 2C - Stabilize or slightly reduce the Unit 1 elk herd hrough harvest of antlerless elk. Continue to emphasize the harvest of migratory elk (by using late season hunt structures) throughout winter range in Unit 1.

Unit 3B - Continue to focus on harvest on the wintering migratory herd through late season antlerless hunt structures. Continue efforts to complete wildlife-use only forage monitoring sites which will provide habitat based data for wild ungulate carrying capacities during both early and late growing seasons. Coordinate with the A-S to increase the number of forage monitoring sites to meet protocol.

3B North - Continue developing and providing a resident elk hunt structure which reduces elk impacts on agricultural lands and addresses private land depredation concerns north of Highway 60 and other U.S. Forest Service boundary. Use all available data (e.g. surveys, depredation complaints, hunter contacts, agricultural and commercial private land issues, and hunter success) to implement hunt structures.

Unit 3A - The long-term goal is to have a minimal resident elk herd. Lower resident elk numbers would reduce private land depredation and potential negative impacts to other wildlife.

Unit 4A - Chevelon – Reduce the population to lower the monitored elk forage use toward the agreed upon forage distribution. The goal is to balance elk herbaceous forage use with the current forage capacity distributed to wild ungulates. Continue to monitor wildlife forage use to help determine future herd unit objectives.

Unit 4B - Pinto Lake – Reduce the population to lower the monitored elk forage use toward the agreed upon forage distribution. The goal is to balance elk herbaceous forage use with the current forage capacity distributed to wild ungulates. Coordinate with the A-S to increase the number of forage monitoring sites to meet protocol. Continue to monitor wildlife forage use to help determine future herd unit objectives.

Unit 4B North - Reduce the resident herd. The long-term goal is to have a minimal resident elk herd. Lower resident elk numbers would reduce private land depredation and potential negative impacts to other wildlife species.

Unit 27 - Reduce the elk herd through the increased harvest of antlerless elk. Continue to monitor wildlife forage use to help determine future population objectives.

Based on State population data and objectives for elk in these hunt units **elk populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely above carrying capacity.**

Taking into account the continuing occurrence of the elk across the Forest in suitable habitat, the abundance and wide distribution of suitable habitats across the Forest,

upward habitat trends for early succession habitat in the Forest, and the presence of a harvestable surplus in the elk population, it appears that the Forest supports a well distributed reproducing population of this species.

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Hairy Woodpecker (*Picoides villosus*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves NF, the hairy woodpecker is a management indicator species for snags in all forest habitat types. The hairy woodpecker (*Picoides villosus*) is a widely distributed, generally nonmigratory, primary cavity-nesting bird of forests across North America to Central America (NatureServe Explorer 2001, DeGraaf et al. 1991). In Arizona, the hairy woodpecker is a common to fairly common resident of coniferous forests throughout the state (Phillips, Marshall, and Monson 1964). The species is also found locally in Arizona pinyon-juniper woodlands, some deciduous woodlands, and riparian habitats (Monson and Phillips 1981). In the Apache-Sitgreaves NF, this woodpecker is considered a fairly common resident (USDA Forest Service 1996a).

The species is most abundant in mature forests, where its special habitat requirements are more likely to be met (NatureServe Explorer 2001). These needs include large, older trees with characteristics suitable for cavity excavation (i.e., heartwood softened by rot). In the Apache-Sitgreaves National Forests, the species has been documented nesting in snags, and in partially dead and live aspen (Li and Martin 1991). Nests are primarily in trees averaging 17 inches diameter at breast high (DBH) and approximately 60 feet tall. The species feeds primarily on insects such as wood-boring beetles removed from dead and diseased trees (DeGraaf et al. 1991). Down logs are also important in supporting insect populations for the hairy woodpecker.

Management Activities or Natural Events That May Affect Habitat

Negative: Excessive gathering of dead and down fuelwood, reducing fuel loads by prescribed fire and wildfire across large areas. Timber harvest that converts mature and late-succession stands to earlier succession.

Positive: Maintaining large trees for future down logs and snags, maintaining standing dead aspen and cottonwood trees, reducing open road densities in areas of highly accessible dead and down material, low-intensity wildfires and insect and disease infestations.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), specific "Standards and Guidelines" in the Forest Plan that apply to snags and mature forests in Management Area 1 (p. 122) include:

- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement pg. 122-2).

- Minimum criteria used to determine old growth include 1 snag/acre in ponderosa pine, 2.5 snags/acre in mixed-conifer, and 3 to 4 snags/acre in spruce-fir. No minimum criteria are identified for identifying aspen old growth (p. 122-2).

- Implementing the Forest snag policy, providing at least 55% of a diversity unit with at least 180 snags per 100 acres. In high-priority areas, including both edge habitats adjacent to meadows or water, manage for an average of 280 snags per 100 acres. Only ponderosa pine/mixed-conifer species will be counted toward meeting minimum snag requirements (p. 122-3).

The amended Forest Plan also includes specific management objectives related to snags and larger trees for Northern Goshawks and Mexican Spotted Owls (pp. 70 to 70-16). This direction was implemented to bring Forest Plans into compliance with the Mexican Spotted Owl Recovery Plan (USFWS 1995) and to "safeguard the viability of northern goshawk" (USDA Forest Service 1996b), but also addressed the habitats for which hairy woodpeckers were selected to represent as a management indicator species. Specifically, these guidelines direct the management of vegetation to:

- Leave at least 2 snags/acre in ponderosa pine forests
- Leave at least 3 snags/acre in mixed-conifer forests
- Leave at least 3 snags/acre in spruce-fir forests

As a "selected prey of the northern goshawk" (Reynolds et al. 1992), hairy woodpeckers were considered in the development of the vegetation management guidelines identified above, that are now a part of the Forest Plan. Implementation of these guidelines is intended to promote "abundant and sustainable" prey populations within goshawk foraging areas. Thus, implementation of Forest Plan direction is likely not only to "safeguard the viability of northern goshawk" (USDA Forest Service 1996b), but also that of hairy woodpeckers.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was snags. The Forest Plan EIS (USDA Forest Service 1987b) reported 60 snags per 100 acres were required to maintain a population of Hairy Woodpeckers at 40% of the maximum potential population size. "The 40% level is considered the minimum that will support a self-sustaining population", and "A minimum of 60 snags per 100 acres is needed to support primary cavity nesters" (p. 201). However, two levels need to be considered when looking at hairy woodpecker habitat across the Forest. First are the overall ponderosa pine and mixed-conifer forest types. Based on the 1996 FIA data (USDA Forest Service 2003a), the Apache-Sitgreaves NF currently has about 912,011 acres of mid- and high-elevation coniferous forests and aspen. This generally agrees with information from the Forests' GIS layer (USDA Forest Service 2005), which shows an estimated 946,387 acres of ponderosa pine, mixed-conifer, spruce-fir, and aspen cover types in the Apache-Sitgreaves National Forests.

The "Habitat Quality Index Model" (HQI; version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for hairy woodpeckers. Based on the FIA data set and coefficients, the model recognized 712,366 acres of year-round habitat that provide some value to the species for foraging. Among these "foraging acres", the model recognized 193,974 acres of year-round habitat that provide some cover value for the species.

Since the FIA data was collected, both timber harvests and wildfires have affected ponderosa pine and mixed-conifer forests. Total annual timber harvest history in the Forest is shown in Figure 1. However, not all timber harvest adversely affects habitat for the hairy woodpecker. Records of harvest levels for the forest (Beal 2005) indicate that there have been 1,890 acres of timber harvests that removed large diameter trees (seed cuts, clearcuts and overstory removals) since 1996 for an average of about 371 acres per year. At the same time, trees are growing in the rest of the Forest and habitat conditions there are gradually improving. Because of this, it is not likely that the habitat capability for hairy woodpeckers has been reduced from that in 1996. See Appendix A for more discussion of forest growth.

Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

Figure 1. Annual timber treatments in the Apache-Sitgreaves NF (1985-2006).

Wildfires have also affected mature and late-succession forests, especially the Rodeo-Chediski fire. Since 1985, acreage burned in the Apache-Sitgreaves National Forests from wildfires totaled less than 2,000 acres per year for 11 years out of 18 (Figure 2). From 1985 to 1996, wildfires impacted about 5,356 acres each year in the Forests. From 1997 to 2001 (after FIA data collection), an average of 1,477 acres each year have been impacted to some extent by wildfires in the Forests. Information is not available summarizing cover types impacted by these fires, or the acreage actually impacted by "high-intensity" conflagrations. However, it is likely that high-intensity fires impacted only a small percentage of these acres (J. Thompson, pers. comm.). Likewise, not all of the acres impacted by high-intensity fires were in habitats important for hairy woodpeckers. Given the wide distribution of hairy woodpeckers across the Forests (Fig. 7), the continued recurrence of wildfires, as observed from 1985 to 2001, is not likely to significantly reduce or fragment the distribution of hairy woodpeckers in the Forests. In addition, this type of fire regime is also not likely to reduce the overall habitat capability for hairy woodpeckers in the Forests to levels where the Forests are no longer able to provide habitat to sustain a reproducing population of the species.

Catastrophic fires, such at the Rodeo-Chediski wildfires of 2002, may cause landscape-wide modifications to the habitat capability of the Forests for hairy woodpeckers. During the Rodeo-Chediski fires, a total of about 18,960 acres of mid-aged, mature, and late-succession forests burned at high or moderate severity, reducing or eliminating the forests' value to hairy woodpeckers. However, increases in snag density in proximity to lightly burned or unburned stands within the fire perimeter likely increases the habitat value of those stands. The Rodeo-Chediski Fire Salvage analysis indicated that habitat capability for hairy woodpeckers did not change substantially due to the fire (USDA Forest Service 2003b). Recent research conducted in burned forests in the Apache-Sitgreaves NF from 2000-2003 indicates that hairy woodpecker populations increased dramatically following wildfire but declined as burned areas aged (Covert 2003). Populations in unburned areas remained stable. Relative abundance of hairy woodpeckers in burned areas returned to that of unburned sites by seven years after the burn, suggesting that wildfire provides an ephemeral benefit to hairy woodpeckers.

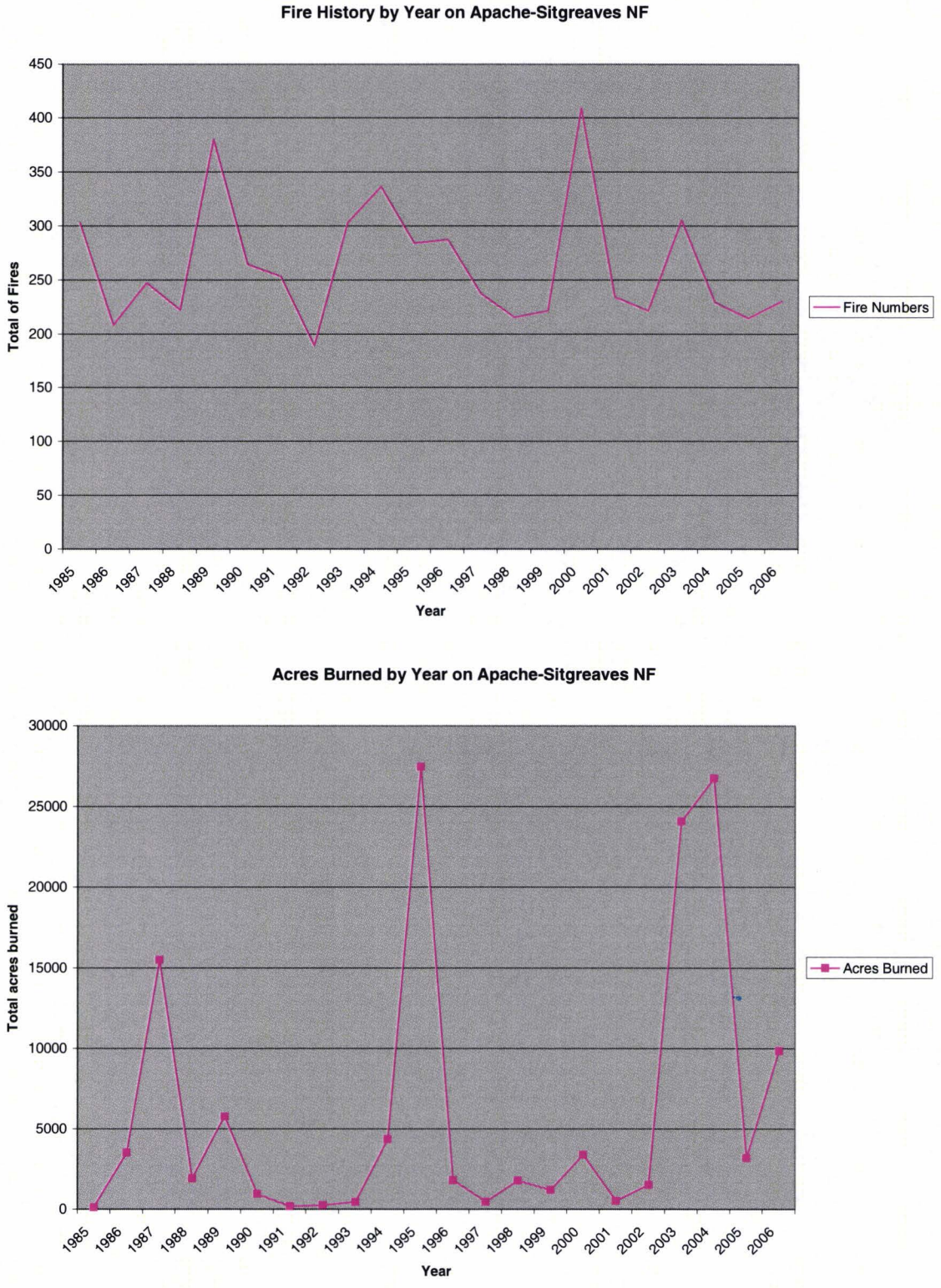

Figure 2. Summary of number of fires and acres burned annually by wildfire and prescribed burn in the Apache-Sitgreaves NF (1985-2006). Actual figure in 2002 was 173,000 acres due to the Rodeo-Chediski fire.

The second level of habitat that needs to be considered in assessing Forestwide habitat trend for the hairy woodpecker is the abundance of dead and down wood. Hairy woodpeckers use snags for both nesting and foraging, and use down logs for foraging. The 1996 FIA for the Apache-Sitgreaves NF estimated there were about 44 million standing dead trees (snags) greater than 1 inch in diameter, averaging 25 snags per acre. Over half of the snags occurred in the ponderosa habitat type. However, not all of these snags have much value for wildlife. About 24% of these snags were between 5 and 10.9 inches in diameter. These snags provided foraging habitat for many species of insectivorous birds. However, most cavity-nesting birds prefer even larger diameter snags for nesting purposes. The FIA data indicates that there were about 3.5 snags per acre that are 11 inches in diameter or greater at the time of the inventory and 1.4 snags per acre that are 17 inches or greater. However, these snags probably were not evenly distributed across the landscape. There were about 8.1 aspen snags per acre greater than 12" diameter available in aspen stands with other large diameter aspen snags scattered in other forest types (e.g. Douglas-fir and white fir).

Snags are not long lived. Snag fall-down rates vary by species, diameter, and cause of mortality. Snag fall down rates for the Apache-Sitgreaves NF have not been estimated but fall down rates for other forests with similar habitat types indicate that most ponderosa snags persist for 2-20 years (Bull et al. 1997). Thus, the persistence of snags across the landscape is dependent on continuing tree mortality. Mortality in the Apache-Sitgreaves NF was estimated based on 1996 FIA data (USDA Forest Service 2003a) at about 13% of gross annual growth. Forty-five percent of this mortality was caused by disease, 28% by fire, and 15% by insects. The remaining 12% was attributed to weather, suppression, and animal damage, in respective order of prominence.

Snags continue to be created by insects and disease in the Forest. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 3 below. Infestations vary widely from year to year but continue to be present in the Forest, creating pockets or larger areas of new snags.

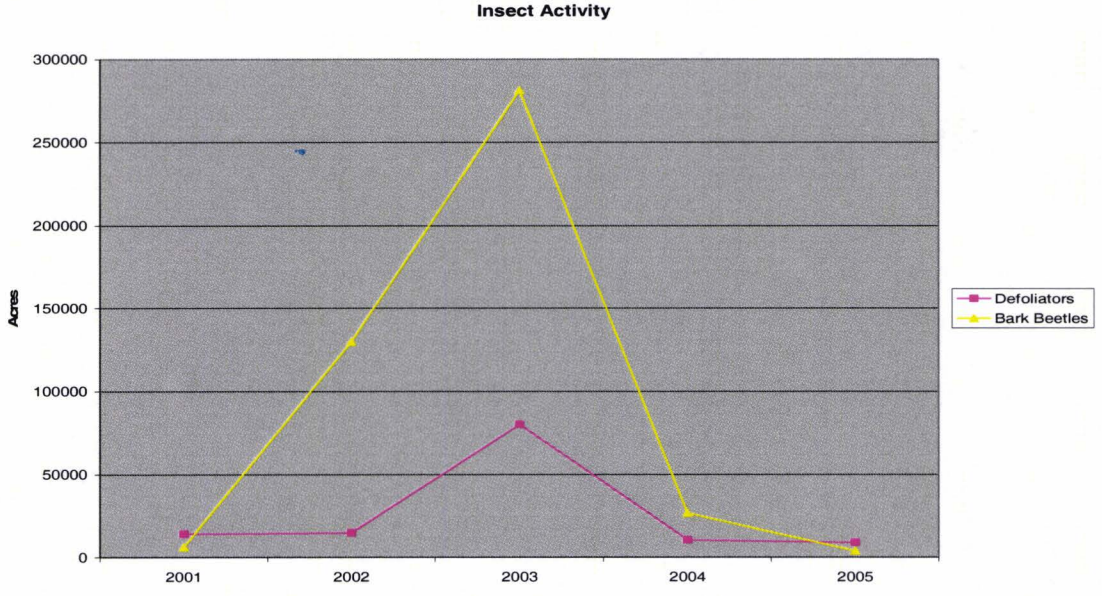

Figure 3. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2005).

Fire also continues to create snags in the Forest. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 6. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771.

The Rodeo-Chediski fire created large numbers of snags in the burned area. Prior to the fire, large snags (≥18" DBH) numbered about 0.4 snags per acre in ponderosa pine habitats and about 1.2 snags per acre in mixed-conifer habitats (USDA Forest Service 2003b). No aspen stands were burned in the fire. After the fire, large snags averaged 7.6 snags per acre across the burned area. There are still pockets of low-severity burned and unburned stands with low snag numbers. Snag densities in these areas are increasing due to increased insect activity (USDA Forest Service 2003b). Snags are expected to fall over in the next 2-20 years depending on tree species and size. No additional recruitment of snags is expected for at least 75 years in areas of moderate and high-severity burn.

The ROD and EIS for the Rodeo-Chediski Fire Salvage project authorized salvage of fire-killed trees on about 34,000 acres of the burned area. Trees to be removed are greater than 12" DBH. Two snags per acre were prescribed to be left in all salvage units. This project was expected to result in an average of 6.3-6.8 large snags remaining across the burned landscape after treatment (USDA Forest Service 2003b).

Based on the information, available **habitat quality for the hairy woodpecker is fair with an upward trend** due to increases in snags, on-going forest growth, and declining timber harvest. However, **conditions are likely still below potential.** For more information on habitat trend in late-succession and snag habitats, see Appendix A.

POPULATION TREND

Hairy woodpeckers are year-round residents of nearly all forest types from central Canada to the southern United States (NatureServe 2005). This species is one of the most common woodpeckers in the Southwest, particularly in riparian habitats and in ponderosa pine, mixed conifers, and spruce-fir forests (Hubbard 1978). Overall the US population is stable (0.53, p=.06) (Sauer et al. 2004).

The hairy woodpecker is widely distributed across North America (Figure 5), breeding from southern British Columbia eastward to southern Ontario and central New York, and south to north-central Florida, the Gulf Coast, Baja California and Mexico (DeGraaf et al. 1991, AOU 1998). Yellow-breasted chats winter from southern Florida and southern Texas to Central America and Panama.

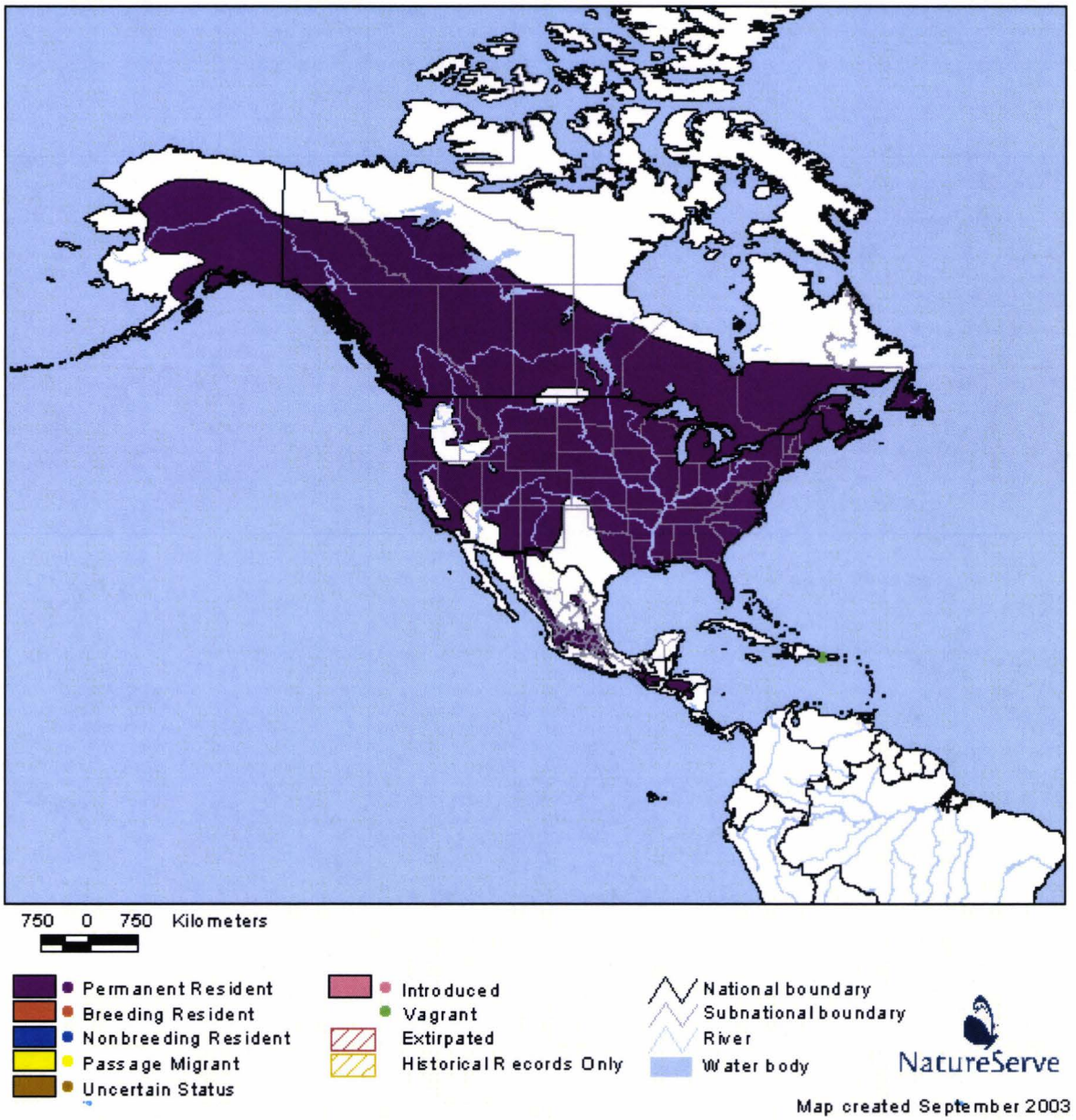

Figure 4. Distribution of the hairy woodpecker in North America (NatureServe 2005).

The Global Heritage State rank for hairy woodpecker is G5 (i.e. globally secure and common, widespread, and abundant) across its range. It has a large range and is common in many areas; there is no evidence of large-scale declines (Figure 5). In the United States, breeding hairy woodpecker populations are ranked N5 (secure); nonbreeders are not ranked. The Arizona Heritage status for the hairy woodpecker is S5 (i.e., secure, common, widespread, and abundant;Nature Serve Explorer 2005).

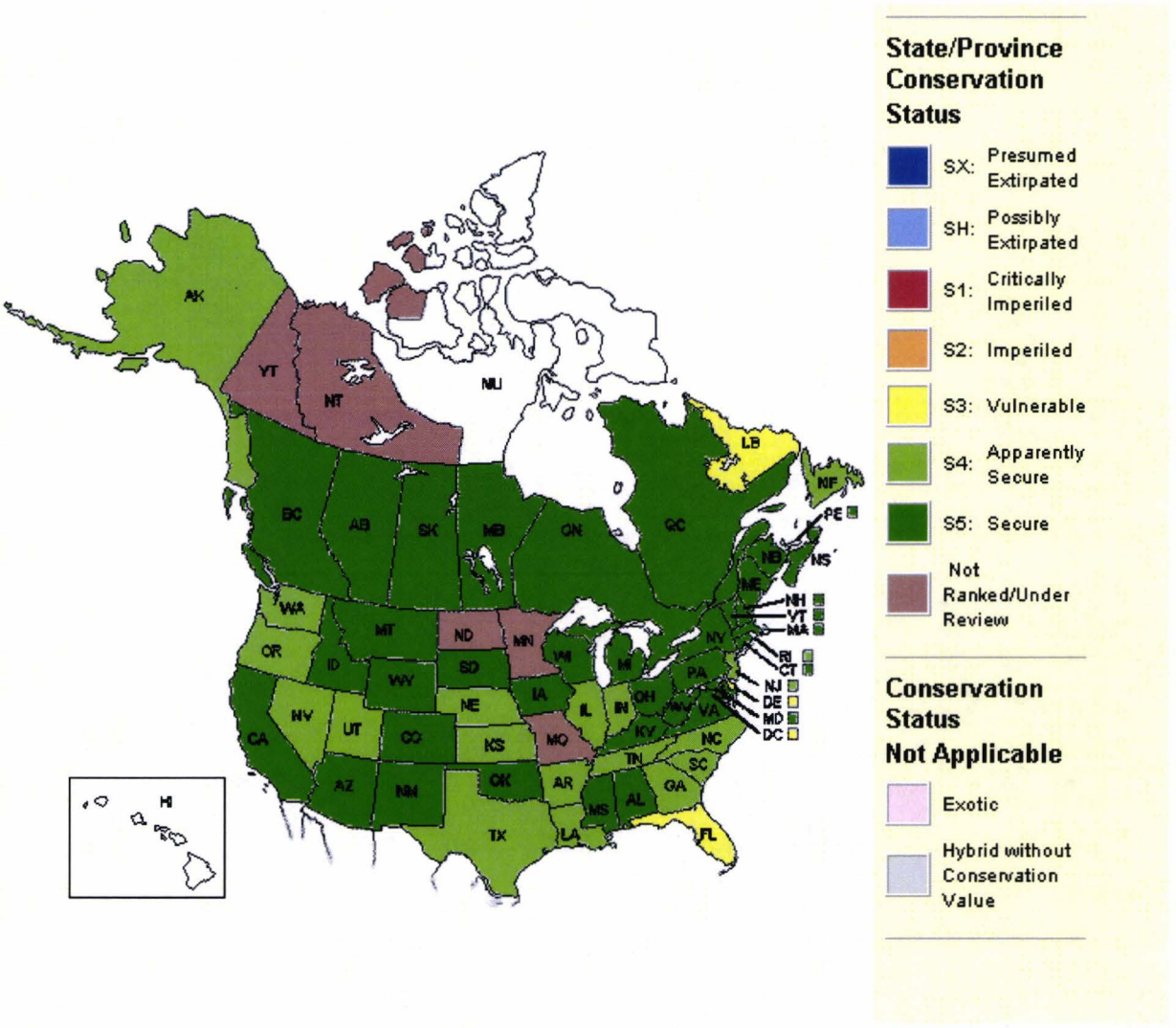

Figure 5. Distribution map of hairy woodpeckers in North America displaying conservation status by State (NatureServe 2005).

Arizona

The hairy woodpecker is considered a common to fairly common resident of both the Apache-Sitgreaves NF and the adjacent Gila NF in New Mexico (USDA Forest Service 1996a; USDA Forest Service 1997).

Monitoring information from the North American Breeding Bird Surveys in Arizona indicates that hairy woodpecker populations and trend are stable and abundant. Summaries of BBS data for Arizona (Sauer et al. 2004) for hairy woodpecker show a nonsignificant ($p = 0.69$) positive trend of 1.28% between 1966 and 2003 (Figure 6). From 1980 to 2003, there has been a nonsignificant ($p = 0.54$) positive trend of 1.8%. This trend estimate is a summary of the population change over the last 37 years, and does not provide information on other patterns of population change (such as cycles) over time. Nineteen survey routes were used in this analysis, and the relative abundance of hairy woodpeckers observed per route was 0.70. These results corroborate the stable trend seen in the nationwide data above.

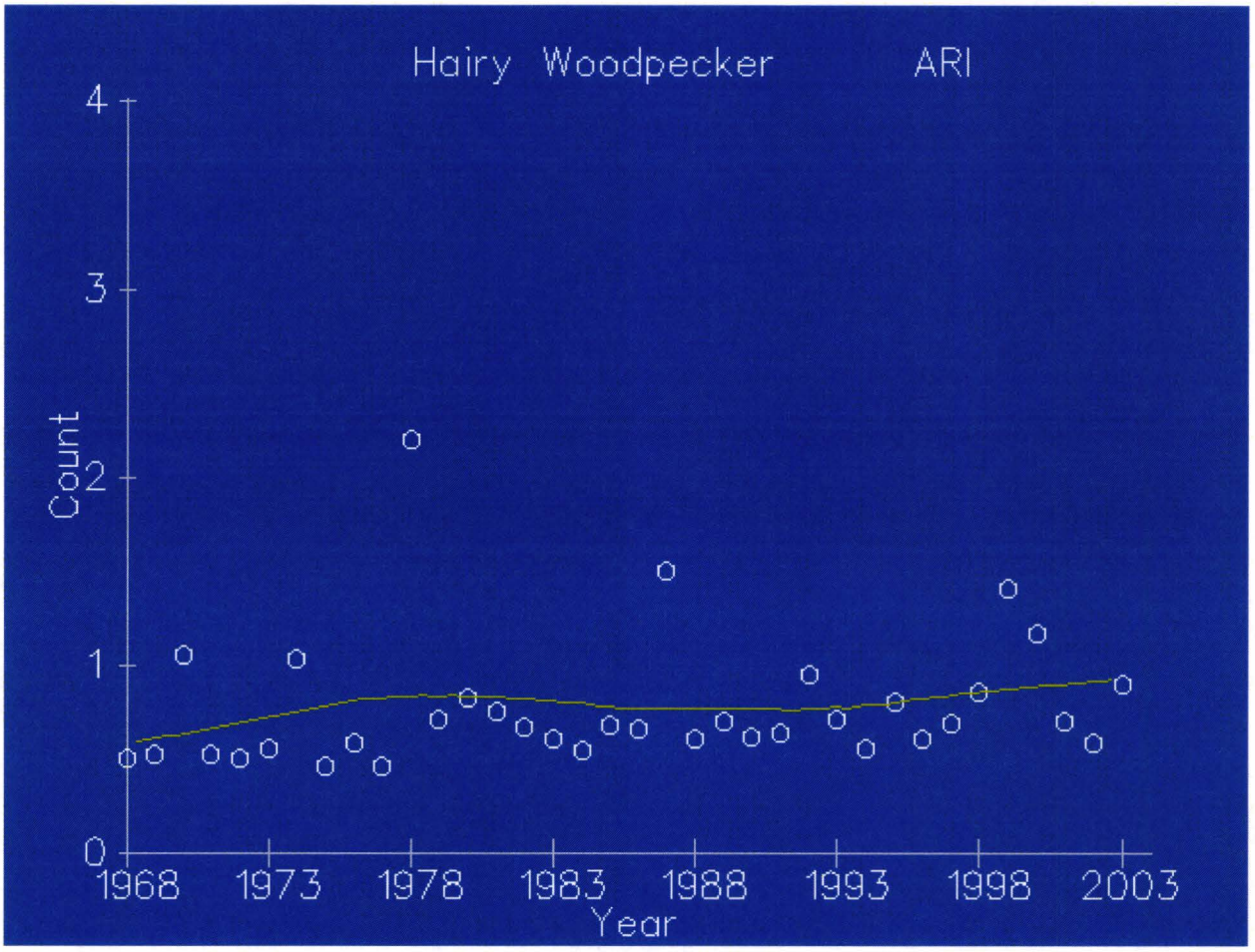

Figure 6. Estimated population trend for hairy woodpecker in Arizona (Sauer et al. 2004)

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The hairy woodpecker was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort also did not identify the hairy woodpecker as a species of concern in this region.

Apache-Sitgreaves National Forest

The Arizona Game and Fish Department (AGF, unpub. data) surveyed a portion (i.e. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Of these, 65 sectors occurred on ASNF lands. A total of 58 breeding hairy woodpeckers were detected from 1993 to 2000 in 56 of these sectors, well distributed across the forest (Figure 7). Habitat associated with each sighting was recorded. Coniferous forests of some type accounted for over 85% of the habitat types recorded at detection sites. Riparian habitats, comprising less than 1% of the Forest, accounted for about 9% of the habitat types recorded at detection sites.

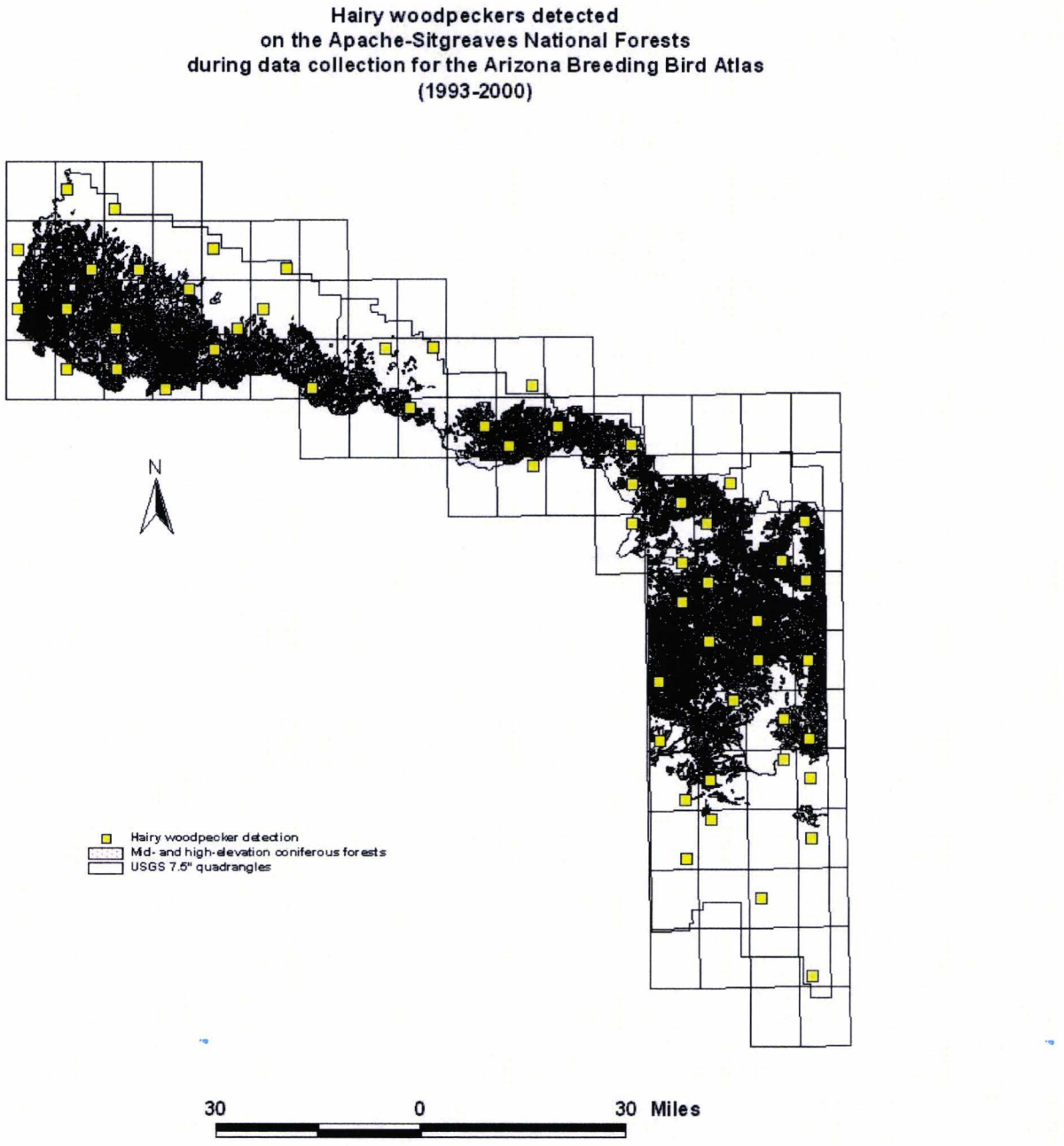

Figure 7. Distribution of hairy woodpecker detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of mid- and high-elevation coniferous forests.

Five Breeding Bird Survey routes are located in the Forest. Most of these routes have been surveyed annually since 1992. Hairy woodpeckers have been detected on all of the 5 routes. Individual route trend information is shown in Table 1. This trend information should be interpreted with caution due to very small sample sizes on each route (Sauer et al. 2004). These trends should not be considered significant. However, the information for each route is relevant

to documenting the general distribution and persistence of the species in the Forests. No habitat data was collected with observations.

Table 1. Breeding bird survey trend estimates for hairy woodpecker

BBS Route	Trend Estimate	P value	Number of Years	Average Count Per Route/Year
Sprucedale	4.81	0.68659	11	1.55
Forest Lakes	-0.96	0.92638	10	2.60
Alpine	10.21	0.79555	6	2.33
Clay Spring	-65.73	.00002	9	0.33
Pinetop	N/A	N/A	6	0.20

Recent MIS monitoring efforts in the Black Mesa Ranger District (unpublished data) conducted from 2001-2005 support the status of the hairy woodpecker as a relatively common species in the Forest. Hairy woodpeckers (n=7, 0, 24, 67,44) were seen in pinyon and pine-oak stands and were one of the more commons species recorded. Hairy woodpecker observations increased noticeably from 2003 to 2004 in areas of high burn severity in the Rodeo-Chediski fire. Hairy woodpeckers were also detected in riparian areas during bird monitoring conducted in the Clifton Ranger District in 2003.

Taking into account the continuing occurrence of hairy woodpeckers across the Forest in a range of habitats, habitat trends for snag habitat in the Forest, and the overall population trend across Arizona, it appears that the Forest supports well distributed, reproducing populations of this species. **Currently, hairy woodpecker populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely lower than potential.** Continued implementation of conservation measures to maintain late-succession habitats and snags should continue to improve hairy woodpecker habitat and populations.

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Juniper (Plain) Titmouse (*Baeolophus ridgwayi*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the plain titmouse is an indicator species for snags (USDA 1987a, p.134). The Analysis of the Management Situation (AMS) (USDA Forest Service 1983) identified the juniper titmouse as a management indicator species for pinyon-juniper habitats. It is a common, nonmigratory resident of pinyon-juniper woodlands in the western and southwestern United States, and the extreme north of Sonora, Mexico (DeGraaf et al. 1991, NatureServe Explorer 2005, Sauer et al. 2004). In Arizona, the species is a fairly common, to common resident in the Upper Sonoran Zone of northwestern, northern, central, and locally southeastern portions of the state (Phillips et al. 1964, Monson and Phillips 1981).

Also known as "plain" titmouse, the juniper titmouse is a resident of deciduous or mixed woodlands, favoring oak and pinyon-juniper (Ehrlich et al. 1988). The titmouse usually nests in natural cavities or old woodpecker holes primarily in oak or pinyon trees, but it is capable of excavating its own cavity in rotted wood. The species feeds mainly on insects, seeds and occasional fruits, and is a bark gleaner. As a cavity nester, large, older trees are an important habitat feature.

Management Activities or Natural Events That May Affect Habitat

Negative: Mechanical removal of pinyon and juniper trees, and wildfire in pinyon-juniper woodlands.

Positive: Encroachment of pinyon and juniper trees into sagebrush and grasslands.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987), includes specific "Standards and Guidelines" in the Forest Plan that are expected to maintain or improve snag habitat and pinyon-juniper woodlands in Management Area 2 including:

1. The alligator juniper component of the ponderosa pine is managed primarily for maintenance and enhancement of wildlife habitat by the following criteria: In areas where alligator juniper comprises less than 50 percent of the total basal area, retain live alligator juniper trees >12 inches DBH. In areas where alligator juniper comprises more than 50 percent of the basal area, live trees >12" DBH may be removed if <25 percent of the crown is living. In both cases, some of the live trees <12" DBH may be removed. Retain at least 40 percent of the trees.

2. Manage for at least an average of 100 snags per 100 acres on 40 percent of the pinyon-juniper woodland acres in each diversity unit. Snags are at least 9" in diameter at the root collar and at least 10' high.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat features for which this species was selected as a management indicator species was snags. However, two levels need to be considered when looking at juniper titmouse habitat across the Forest. First, are the overall pinyon and pinyon-juniper woodland habitat types. Based on the 1996 FIA data set (USDA Forest Service 2003a) and coefficients, the Habitat Quality Index (HQI) model recognized 732,886 acres of year-round habitat that provide some value for foraging by Juniper Titmouse (see Figure 6). Among these acres, the model also identified about 615,843 acres in the Forests that provide year-round cover for the species.

The HQI model (version 18), developed by the USDA Forest Service, Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for juniper titmouse. The HQI generated by this model indicates that the Forest, as of 1996, provided overall habitat capability at about 90% of its potential for the species. This value indicates a general compliance with the Forest Plan objective (p. 74) to maintain or achieve at least 40% of the potential habitat capability for management indicator species.

Since the FIA data was collected in 1996, both timber harvests and wildfires have affected pinyon-juniper and juniper woodlands. The alteration of vegetative structure in the pinyon-juniper cover types is typically prescribed through the mechanical removal of trees (pinyon and juniper) to obtain resource objectives related to fuelwood production and livestock grazing (Forest Plan, p. 145). From 1985 through 2001, about 9,053 acres of pinyon-juniper were impacted by the mechanical removal of trees, averaging about 533 acres per year (Table 1). Since 1996, vegetative treatments were applied each year to about 590 acres of pinyon-juniper (Table 1).

Table 1. Summary of vegetative treatments in pinyon-juniper cover types in the Apache-Sitgreaves National Forests (from D. Beal)

Comment [F1]: Update for 2001-2005?

Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

The Rodeo-Chediski fire of 2002 burned through about 20,810 acres of pinyon-juniper woodlands (USDA Forest Service 2003b). Some areas burned with greater severity than others and not all areas were rendered unsuitable. Since this is a very small

amount compared to the available habitat in the Forest, it is unlikely that the habitat capability for the juniper titmouse has been reduced substantially since 1996.

The second level of habitat that needs to be considered in assessing Forestwide habitat trend for the juniper titmouse is the abundance of dead and down wood. Juniper titmice use snags for both nesting and foraging and down logs for foraging. The 1996 FIA for Apache-Sitgreaves NF estimated that there were about 44 million standing dead trees (snags) greater than 1 inch in diameter, averaging 25 snags per acre. However, not all of these snags have much value for wildlife. About 24% of these snags were between 5 and 10.9 inches in diameter. These snags provided foraging habitat for many species of insectivorous birds including juniper titmice. However, most cavity-nesting birds, including the juniper titmouse prefer even larger diameter snags for nesting purposes. The FIA data indicates that there were about 3.5 snags per acre that are 11 inches in diameter or greater at the time of the inventory. About 27% of these large snags were found in pinyon-juniper woodlands (USDA Forest Service 2003a).

Snags are not long lived. Snag fall-down rates vary by species, diameter, and cause of mortality. Snag fall down rates for the Apache-Sitgreaves NF have not been estimated, but fall-down rates for other forests with similar habitat types indicate that most ponderosa pine snags persist for 2-20 years (Bull et al. 1997). Thus, the persistence of snags across the landscape is dependent on continuing tree mortality. Mortality in the Apache-Sitgreaves NF was estimated based on 1996 FIA data (USDA Forest Service 2003a) at about 13% of gross annual growth. Forty-five percent of this mortality was caused by disease, 28% by fire, and 15% by insects. The remaining 12 percent was attributed to weather, suppression, and animal damage, in respective order of prominence.

Snags continue to be created by insects and disease in the Forest. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 1. Infestations vary widely from year to year but continue to be present in the Forest, creating pockets or larger areas of new snags. Pinyon *Ips* was present in fluctuating levels during all survey years at levels proportionate to overall insect activity. The sporadic activity by this insect indicates that new snags in pinyon-juniper continue to be created over time.

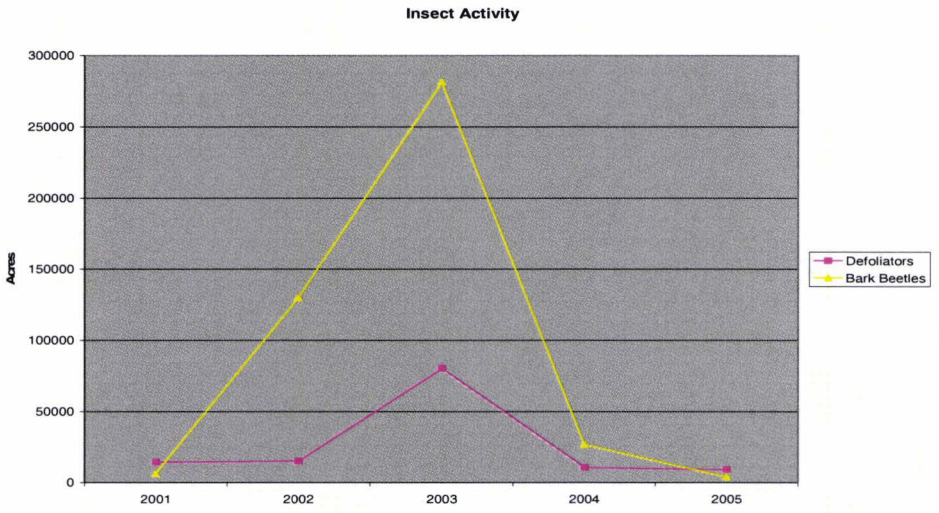
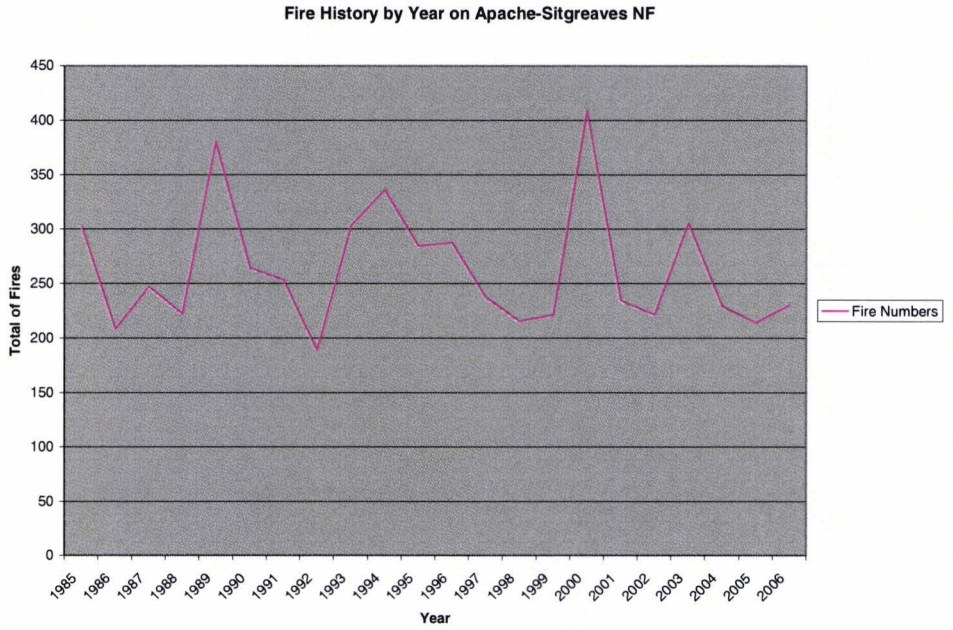


Figure 1. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2005).

Comment [F2]: Can you get info for 2005? Check with Forest Pathogen group at RMS in Flagstaff.

Fire also continues to create snags in the Forest. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 2. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771 (see Appendix A). The fires thin stands and create a better mosaic of dense and thinner canopies that provide for nesting and foraging opportunities for the juniper titmouse.



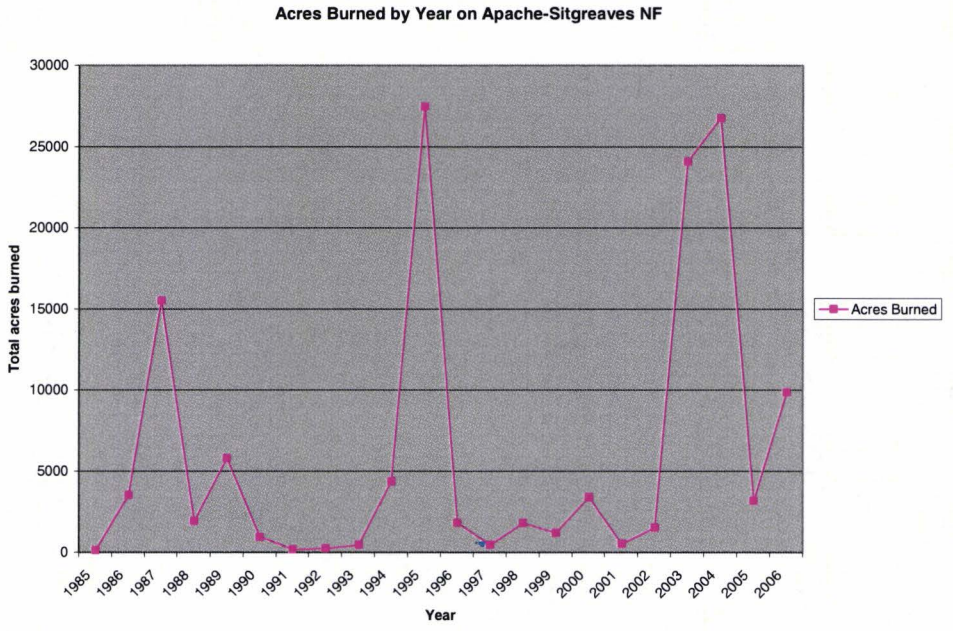


Figure 2. Summary of acres burned annually by wildfire in the Apache-Sitgreaves NF (1985-2002). Actual figure in 2002 was 173,000 acres.

Comment [F3]: Can we get data from 2004 and 2005?

Based on available information, **snag habitat in pinyon-juniper woodlands is in good condition and on an upward trend** due to the effects of recent wildfire and continuing endemic levels of insect activity.

POPULATION TREND

The juniper titmouse is a year-round resident of nearly all pinyon-juniper and juniper woodland forest types from Mexico north to Idaho (see Figure 3) (Natureserve 2005). Throughout its range, the species is considered secure (Heritage Global Status: G5; National Status Rank: N5; Arizona Status Rank: S5) (NatureServe Explorer 2005). Overall, the US population of juniper titmice is stable (0.13, p=0.95750) (Sauer et al. 2004).

The Global Heritage Status for juniper titmouse is G5 (i.e., globally secure and common, widespread, and abundant) across its range. It has a fairly large range in the western United States and is common in many areas; although it is considered rare at the periphery of its range (Figure 3). In the United States, breeding juniper titmice populations are ranked N5 (secure); nonbreeders are not ranked. The Arizona Heritage status for the juniper titmouse is S5 (i.e., secure, common, widespread and abundant) (Nature Serve Explorer 2005). Figure 4 displays population trend data for the species across its range.

Arizona

Sauer et al. (2004) report between 1966 and 2003 there was no significant population trend (-2.88, p=0.39044) for the juniper titmouse in Arizona (see Figure 5). Similarly, analysis of data from Arizona between the years 1980 and 2003, detected no significant change in breeding juniper titmouse populations (-3.86%, p=0.27093, n=18). These trend estimates are summaries of the population change over the last 37 and 23 years respectively, and do not provide information on other patterns of population change (such as cycles) over time. Twenty-two survey routes[1] were used in this analysis, and the relative abundance of juniper titmice observed per route was 0.85. These results corroborate the stable trend seen in the nationwide data above.

[1] Numbers reflect the abundance of the species near the survey route. They are averages of the total counts along the route for the period 1989-1998. Because each survey route is 24.5 mi long, and consists of 50, 3-minute counts along the length of the route, the abundance estimate represents the number of birds that a very good birder would encounter in about 2.5 hours of roadside birding in the area near the BBS route (Sauer et al. 2004).

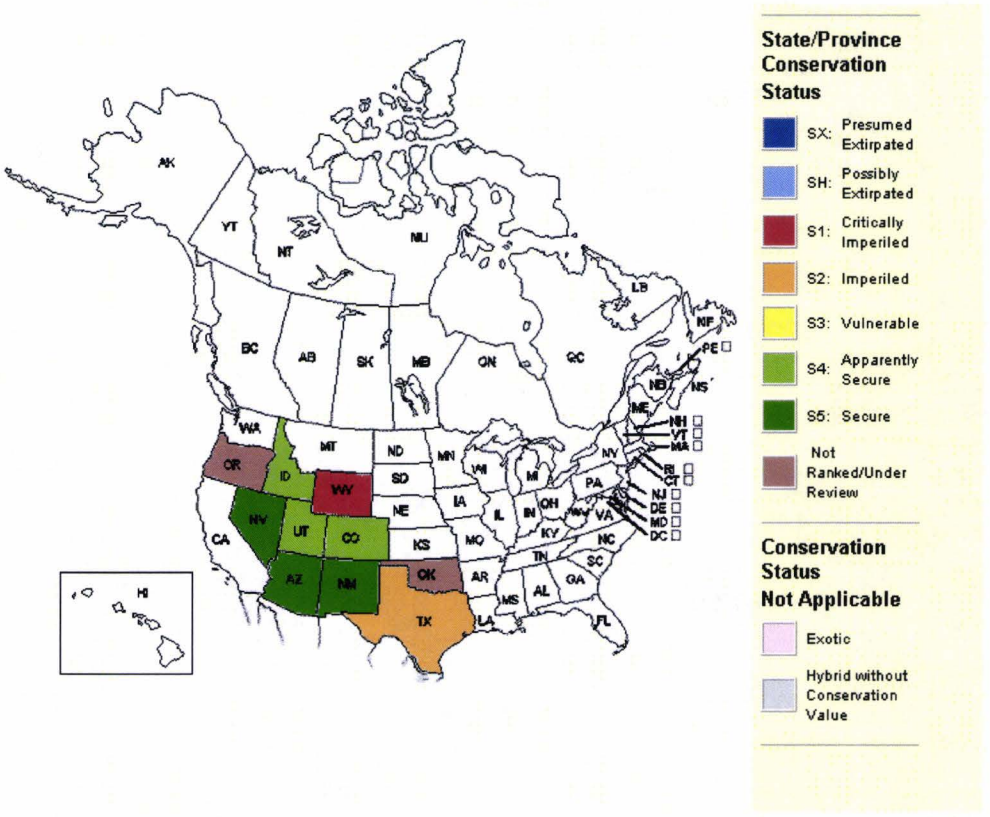


Figure 3. Distribution map of juniper titmouse in North America displaying conservation status by state (Natureserve 2005).

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The juniper titmouse was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). The Arizona Partners in Flight also lists a statewide population objective for the titmouse as "Maintain current statewide population of 110,000 individuals". The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort did not identify the juniper titmouse as a species of concern in this region.

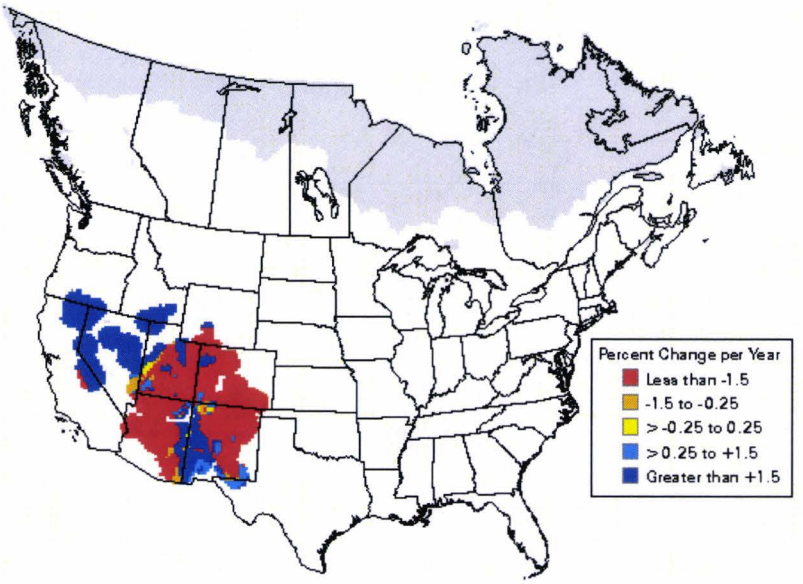


Figure 4. Breeding Bird Survey population trend map for the juniper titmouse from 1966-2003 (Sauer et al. 2004)

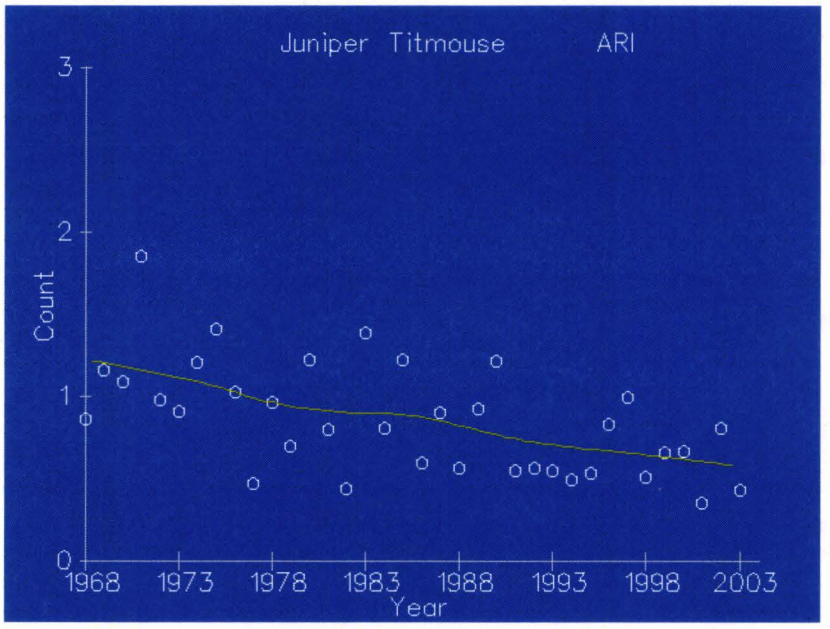


Figure 5. Estimated population trend for the juniper titmouse in Arizona from 1966-2003 (Sauer et al. 2004).

Comment [F4]: Did you check for updated info on the PIF website?

Apache-Sitgreaves National Forest

The juniper titmouse is considered a fairly common permanent resident of the Apache-Sitgreaves NF (USDA Forest Service 1996), as well as the adjacent Gila NF (USDA Forest Service 1997).

In support of the Arizona Breeding Bird Atlas (ABBA) project, the Arizona Game and Fish Department surveyed a portion (1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Forests. Of these, 65 sectors occurred in the Forests. Breeding juniper titmice were detected, from 1993 to 2000, in 29 of these sectors across the Forests (Figure 6). Over 80% of the breeding juniper titmouse sightings recorded by the ABBA effort were associated with habitats where pinyon and/or juniper are primary constituents (Table 2). Over 90% of the sightings were associated with habitats where pinyon and/or juniper are at least represented in the description of the habitats.

Comment [F5]: Check with the ABBA publication. Put citation in.

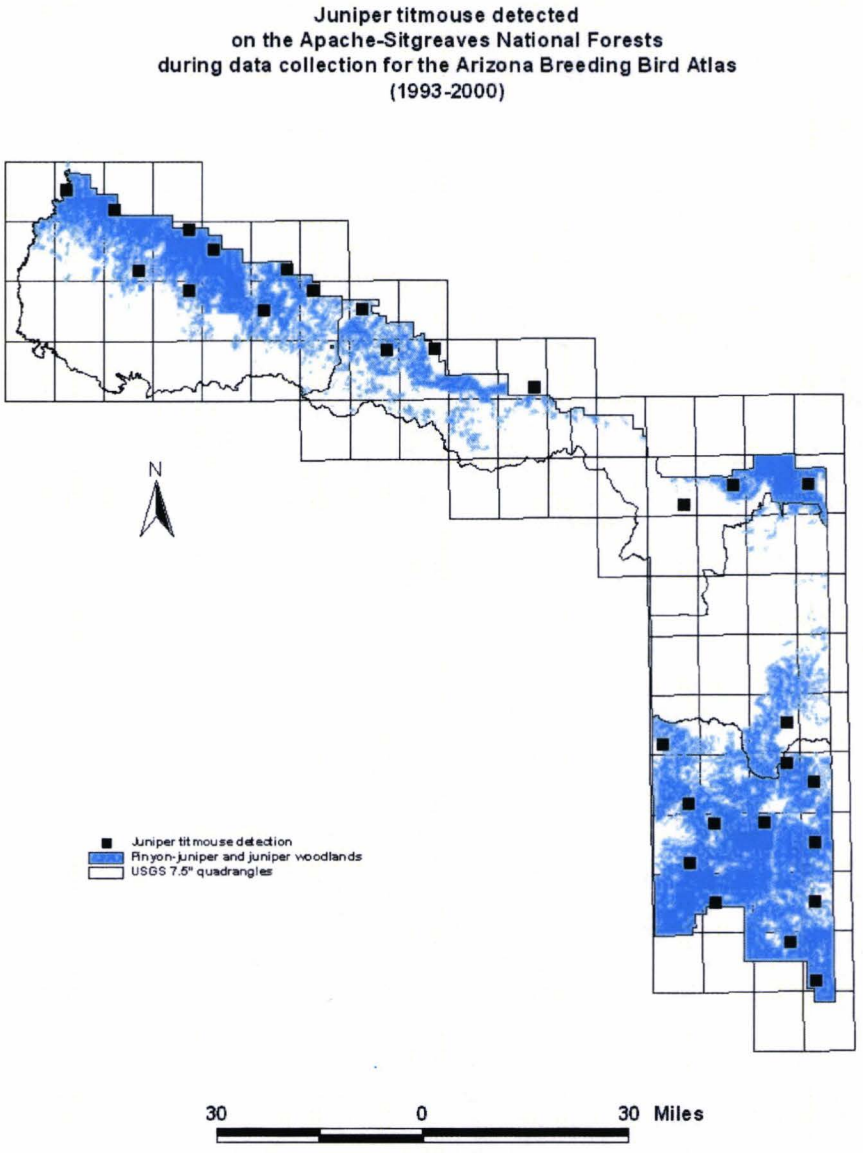


Figure 6. Distribution of juniper titmouse detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of pinyon-juniper and juniper woodlands.

There are five Breeding Bird Survey transects in the Apache-Sitgreaves NF. Most of these routes have been surveyed annually since 1992. Juniper titmice were detected on

four of the five routes, being absent on only the "Alpine" route (Table 2). Absence of juniper titmouse on this route is not unexpected because the route apparently only samples high-elevation coniferous forests and grasslands from near Luna Lake (7900') to near Big Lake (elev. 9000'). The four BBS routes that did detect juniper titmouse typically identified the species repeatedly over the years.

Individual route trend information is shown in the table below. This trend information should be interpreted with caution due to a very small sample sizes on each route (Sauer et al. 2004). These trends should not be considered significant. However, the information for each route is relevant to documenting the general distribution and persistence of the species in the Forests.

Table 2. Breeding bird survey trend estimates for juniper titmouse.

BBS Route	Trend Estimate	P value	Number of Years	Average Count Per Route/Year
Sprucedale	7.10	0.69745	11	1.00
Forest Lakes	-15.36	0.19283	10	4.80
Alpine	N/A	N/A	6	0
Clay Spring	6.97	0.66662	9	6.78
Pinetop	-63.91	0.01158	5	2.40

Recent MIS monitoring efforts on the Black Mesa Ranger District (unpublished data) conducted from 2001-2005 support the status of the juniper titmouse as a relatively common species on the Forest. Juniper titmice were one of the more common species (n=48, 7, 8, 9, 9) and were seen where pinyon-juniper was present.

Comment [F6]: Update from Brian's data, any trend?

Taking into account the continuing occurrence of the juniper titmouse across the Forest in suitable habitat, the abundance and wide distribution of pinyon-juniper and juniper woodlands across the Forest, stable trends for snag habitat and pinyon-juniper habitat on the Forest, and the overall population trend across Arizona, it appears that the Forest supports a well distributed reproducing population of this species. **Currently, juniper titmouse populations on the Apache-Sitgreaves National Forest are considered to be stable,** and likely near potential.

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Lincoln's sparrow (*Melospiza lincolnii)*

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the Lincoln's sparrow is an indicator species for high elevation riparian habitat (USDA 1987a, p.134). The Lincoln's Sparrow (Melospiza lincolnii) is a neotropic migrant that breeds in boreal regions or in subalpine ecosystems of mountain ranges elsewhere (Ammon 1995). Breeding occurs from western and central Alaska across Canada to New England and Nova Scotia, south to southern California and the southwestern United States. The Lincoln's Sparrow is considered a long distance migrant, wintering in southern United States south regularly to Honduras and casually to central Panama and the West Indies (NatureServe 2001) and El Salvador (Erlich et al. 1988).

The Lincoln's Sparrow summers in habitats at elevations ranging from 6-9,000 ft or 1830-2745 m (Latta et al. 1999). In the Southwest, it is associated with riparian habitat often at the edges of conifer and deciduous forests and is found in wet meadows, marshy thickets and bogs during the breeding season. It may occasionally be found in desert riparian woodland where streams provide sufficient moisture for a narrow band of trees and shrubs. Marshy areas with rush, bulrush, sedge and cattails at lower elevations are important winter habitat (Bison-M 2002).

Lincoln's Sparrow is a distinct microsite specialist, preferring low willow cover with dense ground vegetation (Ammon 1995). Lincoln's Sparrows eat insects, grains and seeds, foraging on the ground under grass and brush (NatureServe 2001); nestlings likely feed exclusively on insects (Erlich et al. 1988). Nests of grass or sedge occur on the ground and are found in grass tussocks or sunk in shallow depressions, typically in wet or boggy locations (Ammon 1995). When disturbed, females "mouse-run" along the ground or, when young are present, perform broken-wing displays (Erlich et al. 1988). The breeding season extends late May through July (Bison Taxonomy). Clutch size is typically 3-6, and there is one, possibly two, broods per season (Gough et al. 1998). Brown-headed Cowbird (Molothrus ater) parasitism is thought to occur rarely (Erlich et al. 1988).

In the Southwest, Lincoln's Sparrows are found in the White and San Franciso Mountains of Arizona (Phillips et al. 1964) and in central to northern New Mexico (Ammon 1995). In Apache County, Arizona, Rosenberg and Terrill (1986) note that the Lincoln's Sparrow is a common summer resident of riparian areas in association with spruce/fir or aspen forests. It is a common migrant in dense low cover with grass and weeds throughout Arizona (Monson and Phillips 1981). While most Lincoln's Sparrows winter south of the US/Mexican border (Bison-M 2002), some are found wintering in southern reaches of states such as Arizona and New Mexico. In central New Mexico, summer and winter ranges overlap (Ammon 1995).

Management Activities or Natural Events That May Affect Habitat

Negative: Overgrazing of high elevation riparian areas, modification of stream flow regimes, disturbance or destruction of riparian shrubs.

Positive: Proper management of livestock grazing, exclusion of livestock grazing from riparian areas, riparian and stream habitat improvement efforts.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

In the Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), specific "Standards and Guidelines" in the Forest Plan that apply to high elevation riparian habitats in Management Area 3 include:

- Maintain riparian and meadow communities by providing waters for livestock and wildlife away from sensitive riparian areas.
- Manage for and maintain at least 60% of the woody plant composition in three or more riparian species. Manage for and maintain at least three age classes of riparian woody plants with at least 10% of the woody plant cover in sprouts, seedlings, and saplings.
- Manage for and maintain at least 60% near-natural shrub and tree crown cover.
- Amendment 1 - Give preferential consideration to riparian area dependent resources in cases of unsolvable conflicts. Manage to maintain or improve riparian areas to satisfactory riparian condition [defined in glossary, page 277-1]. Other resource uses and activities may occur to the extent that they support or do not adversely affect riparian dependent resources.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat features for which this species was selected as a management indicator species was high elevation riparian. The Forest Plan EIS lists a total of 10,101 acres of riparian habitat (Figure 6). Those riparian areas above the Mogollon Rim are considered high elevation. In the late 1980s, grazing by livestock and elk were resulting in adverse impacts to riparian habitat in the Forests (USDA Forest Service 1987b). Overgrazing of riparian areas was identified as a public issue in the EIS. Six of the 25 major watersheds in the Forest were considered to be in unsatisfactory conditions due primarily to inadequate vegetative ground cover. The Fisheries and Riparian Habitat Improvement Implementation Plan for the Apache-Sitgreaves NF estimated that about 72% of the riparian forest was in unsatisfactory condition (USDA Forest Service, no date). In the Forest Plan EIS, deteriorated areas were discussed as having an absence of shrubs or trees or a lack of regeneration along stream banks. Stream banks were described as unstable with elevated stream temperatures, reduced aquatic diversity, depleted fish habitat, and extremely limited terrestrial wildlife habitat. The EIS cited both excessive livestock grazing as well as heavy browsing by elk as problems in higher riparian areas. Riparian conditions were expected to improve to satisfactory condition by the fifth decade of the Plan.

Since the Forest Plan was approved, actions have been taken to improve riparian conditions. The number of livestock animal unit months (AUMs) in the Forests has been reduced significantly and several riparian areas have been excluded from livestock grazing. Some ranger districts have entered into elk forage use agreements with the

Arizona Game and Fish Department to reduce elk impacts to other wildlife habitat. These actions have helped improve riparian conditions in some areas of the Forests. However, in other areas little improvement has been documented.

The Forest uses the proper functioning condition assessment process to evaluate the health of streams during project-level analysis (USDI Bureau of Land Management 1995). Riparian areas are "functioning properly" when adequate vegetation, landform, or large woody debris are present to dissipate energy, filter sediment, improve flood-water retention, stabilize streambanks, develop diverse channel characteristics, and support greater biodiversity.

A total of 385 miles of stream were evaluated using this method since 1998. This represents about one-third of the perennial streams in the Forest. Based on the sample of streams evaluated using PFC methodology, it appears that only about 22% are in satisfactory hydrologic condition. This methodology does not evaluate riparian vegetation in terms of value to wildlife. However, it is unlikely that streams not functioning properly in hydrologic terms can maintain healthy riparian habitat for wildlife.

Springs and seeps in mid- to high-elevation meadows have generally remained in poor condition. A few have been fenced to exclude livestock and/or elk and have shown great improvement. The riparian area shown in Figure 1 has been fenced to exclude livestock but still receives heavy utilization by elk.

Figure 1. Lincoln's sparrow habitat inside fenced riparian pasture at Greer, AZ.

The Forest has been involved in a willow recovery program since 1989 in the Springerville Ranger District (Granfelt 2003). The project has included fencing and monitoring of plant vigor and survival especially with regard to Arizona willow (*Salix arizonica*) and Bebb's willow (*Salix bebbiana*). While this recovery program targets only two willow species, it is indicative of the conditions of willows in general in the Forest. Although some willow species fare better than others under heavy grazing, none do well.

Willows in riparian areas, especially at higher elevations show severe hedging and lack of regeneration due to heavy herbivory by both cattle and elk (Figure 2) (Granfelt 2003).

Figure 2. Lincoln's sparrow habitat in unprotected area along Los Burros Creek in May 2003 (Granfelt 2003).

Higher elevation riparian areas on the Forests remain detrimentally impacted by both elk and livestock. About 22% of the streams currently are in satisfactory conditions compared to the estimated 28% at the time of the Forest Plan. However, this difference may not be significant. Differences in assessment methodologies alone could account for this discrepancy. However, it is unlikely that there has been substantial improvement in riparian habitat across the Forest. Based on the information available, **riparian habitat quality in higher elevation areas is currently fair to poor. Trend in many of these areas appears static.** This is well below potential. See appendix A for further discussion of high elevation riparian habitat.

POPULATION TREND

NatureServe Explorer (2001) provides an overview of the status of the Lincoln's Sparrow. Throughout its range, the species is considered secure (Heritage Global Status Rank G5, National Status Rank N5B, N5B). In Arizona the breeding segment of the population is considered vulnerable (S3B) while the nonbreeding segment is considered secure (S5N) (see Figure 3). In New Mexico it is considered apparently secure (S4B) and secure (S5N) for the breeding and nonbreeding segments, respectively. In surrounding states (NV, UT, CO), its status ranges from secure to apparently secure to vulnerable.

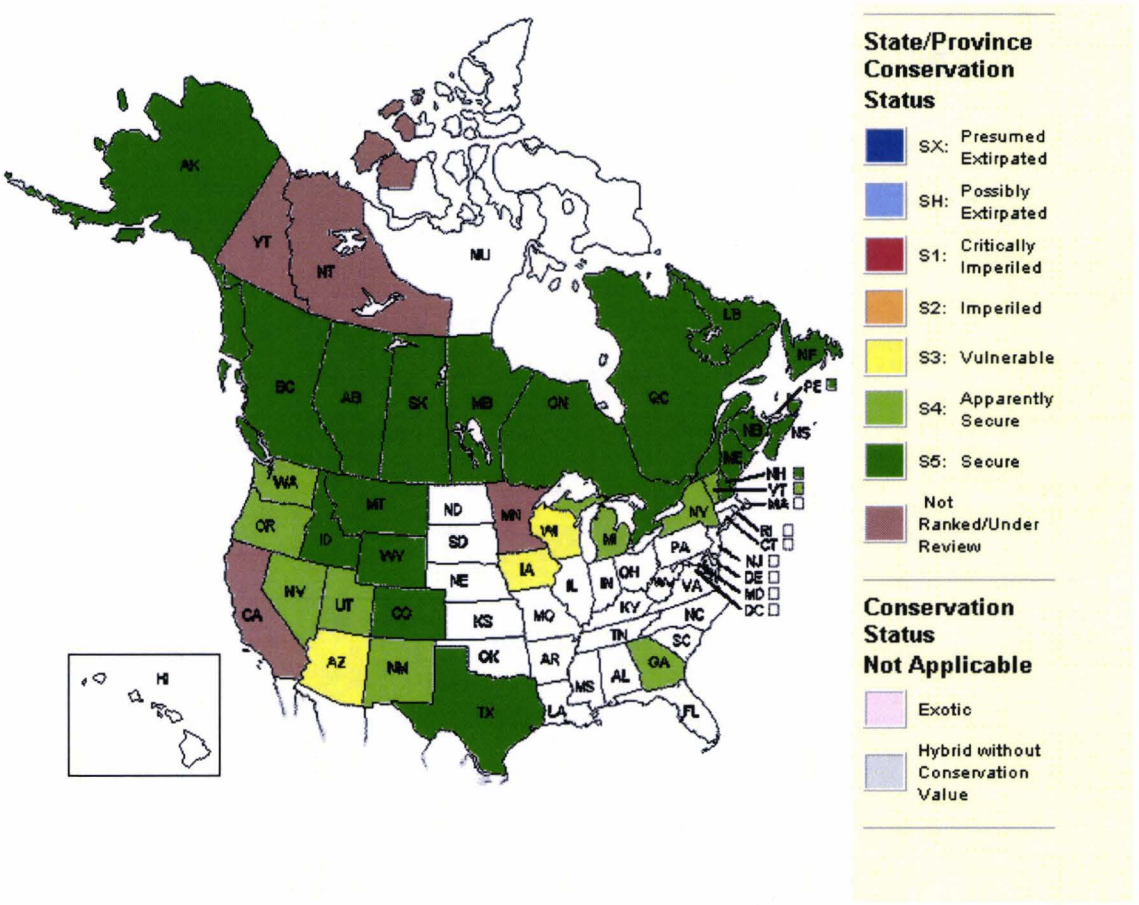

Figure 3. Distribution map of Lincoln's sparrow in North America displaying conservation status by state (Natureserve 2005).

Overall, the US population of Lincoln's sparrows is increasing slightly (2.70, p=0.00434) (Sauer et al. 2004). Figure 4 displays population trend data for the species across its range.

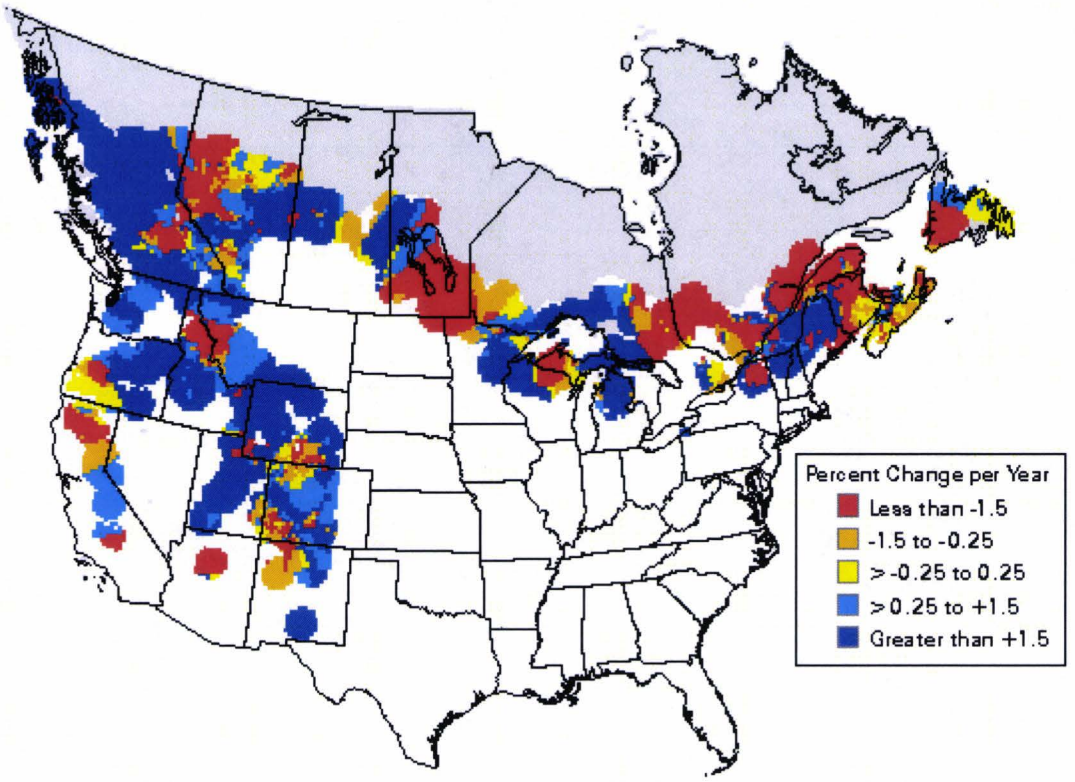

Figure 4. Breeding Bird Survey population trend map for the Lincoln's sparrow from 1966-2003 (Sauer et al. 2004)

Arizona

Five BBS routes are represented on the Apache-Sitgreaves National Forests (ASNFs). From 1966 to 2000, the Lincoln's Sparrow was detected on just one route, the Alpine route. This data was not adequate to estimate population trend, however, the trend for the state of New Mexico that has similar Southwest habitats is shown below (Sauer et al. 2004). Trend data from New Mexico (see Figure 5) indicates that populations are stable (3.10, p=0.43841) (Sauer et al. 2004). However this trend estimate is based on only five routes with an average of only 0.29 individuals seen per route. The trend for Lincoln's sparrow in the southern Rockies region provides a more acceptable estimate at 1.67% (p=0.11865) using information from 56 routes with an average of 8.87 birds seen per route. This information supports the national trend data presented above.

Christmas Bird Count data (Audubon 2005) indicate that Lincoln's sparrow is a fairly common winter resident in Arizona but at lower elevations where snow cover is not persistent. Lincoln's sparrows were not observed in Springerville during CBC surveys. They were only observed 9 out of the last fifteen years (1987-2004) during the Flagstaff CBC with only 1-5 individuals seen in any one year.

However, Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The Lincoln's sparrow was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort did not identify the Lincoln's sparrow as a species of concern in this region.

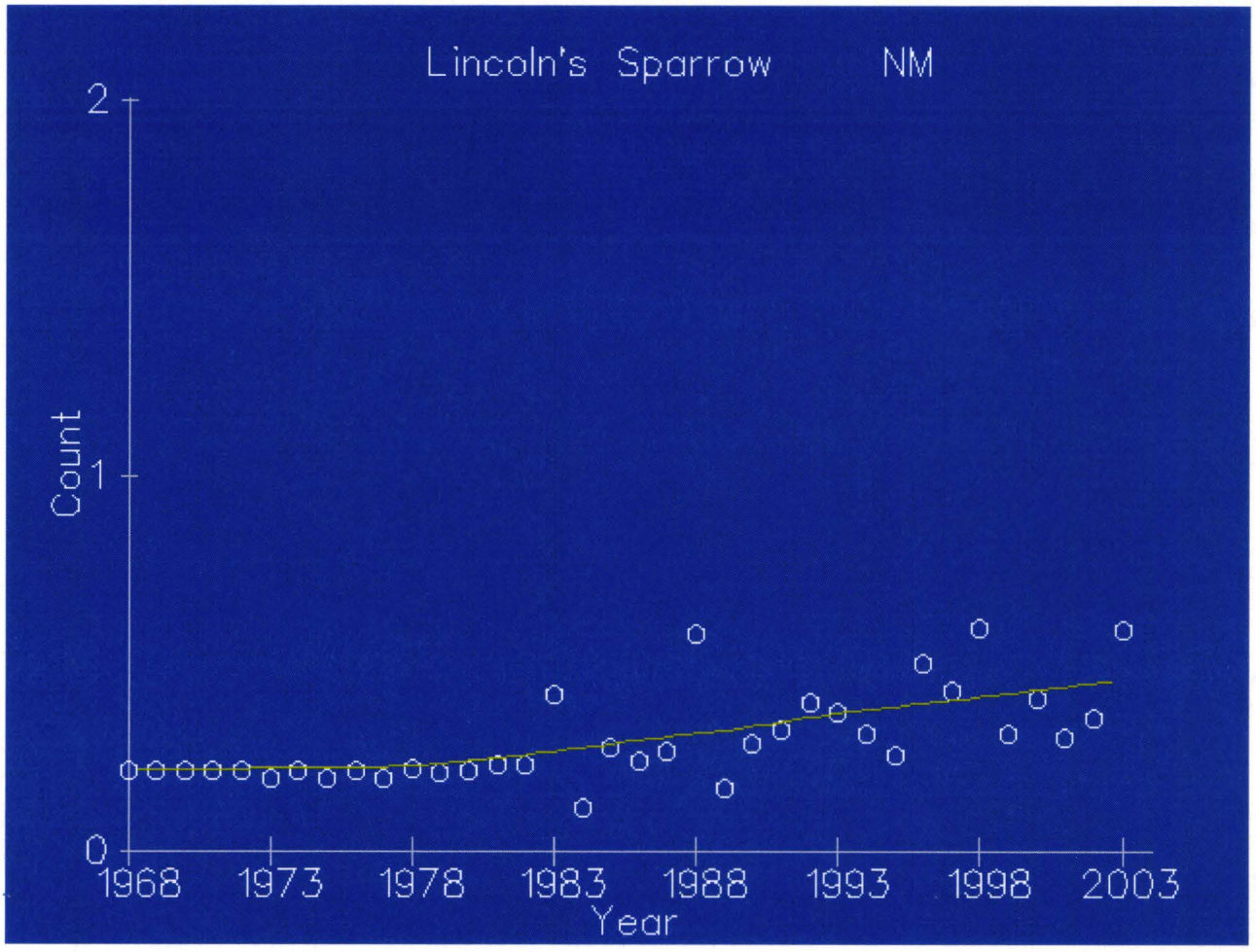

Figure 5. Estimated population trend for the Lincoln's sparrow in New Mexico from 1966-2003 (Sauer et al. 2004).

Apache-Sitgreaves National Forest

The Lincoln's sparrow is considered an uncommon migrant in the Apache-Sitgreaves NF (USDA Forest Service 1996), In the adjacent Gila NF (USDA Forest Service 1997) the species is considered an uncommon winter resident.

The Arizona Game and Fish Department surveyed a portion (e.g. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Sixty-five 1/6th-quadrangles occurred on ASNF lands. Breeding Lincoln's

Sparrows were detected in 3 of these sectors, twice in 1993 and once in 2000 (see Figure 6).

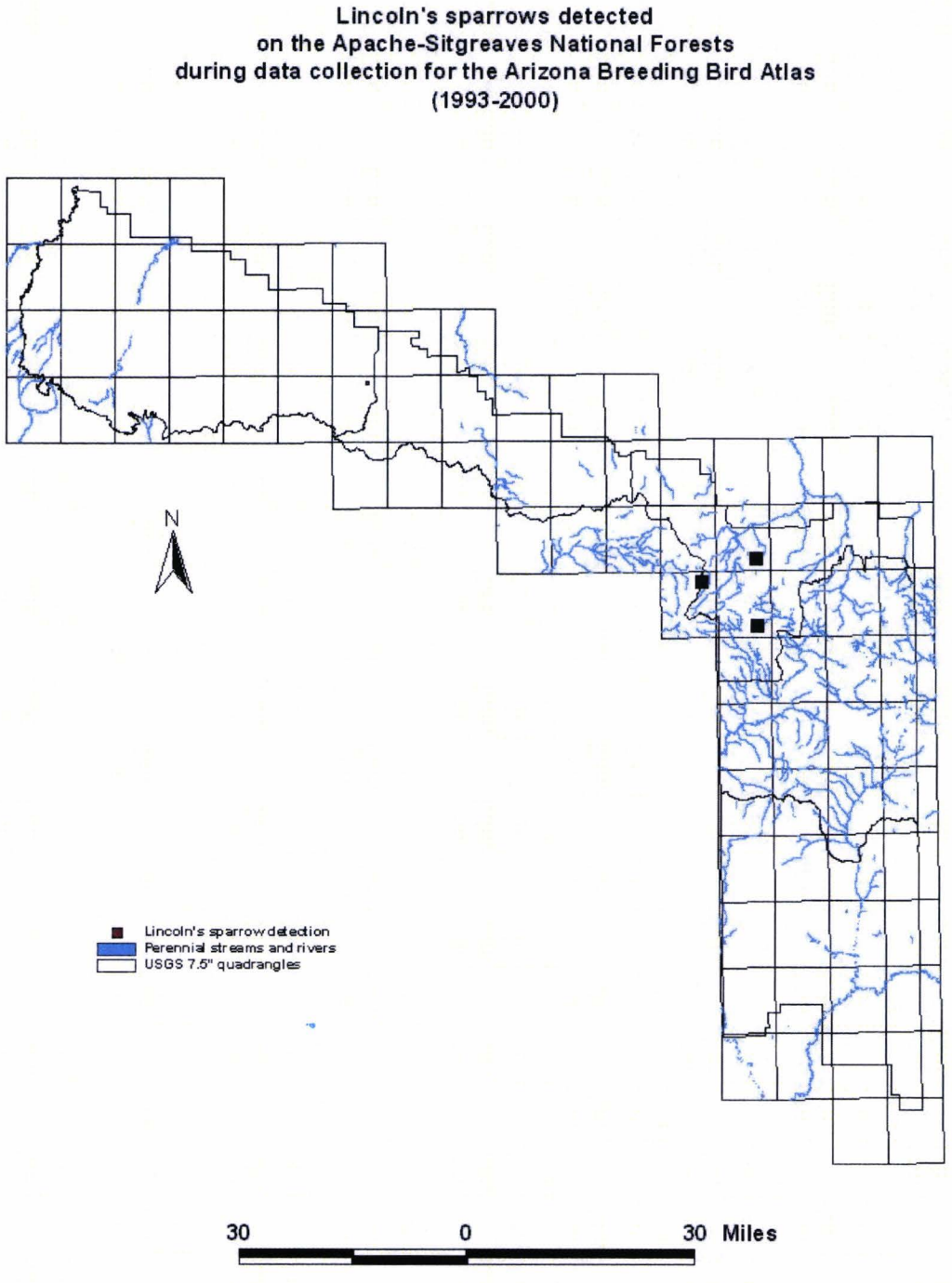

Figure 6. Distribution of Lincoln's sparrow detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of pinyon-juniper and juniper woodlands.

The general area of these three surveys encompassed by these 1/6th-quandrangles are: south of White Mountain Reservoir, Thompson Ranch and the heads of Rosey and Benny Creeks and a portion of the West Fork Little Colorado River. The biotic community noted for these detections is artic-boreal wetlands that can include willow and alder.

It appears that the Lincoln's sparrow is a rare but persistent breeder on the Forest. Poor habitat quality and static habitat trend in high elevation riparian areas may contribute to low population levels. But nowhere in the Arizona or New Mexico, is the species a common breeder. It is a more common winter resident in Arizona but not on the Forest due to the presence of continuous snow cover. **Currently, Lincoln's sparrow populations in the Apache-Sitgreaves National Forests are considered to be low but stable. Populations may be below potential.** However, the Lincoln's sparrow in Arizona is at the extreme southern extent of its breeding range. It does not appear that this species is present in sufficient numbers to be useful as management indicator species. Riparian habitats in Arizona may not provide optimal habitat for this species whose primary range is located further north, extending well into Canada and even Alaska. Drought may have further reduced habitat suitability on the Apache-Sitgreaves recently. Another species may be better suited as a management indicator of riparian habitat quality for the Forests.

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Lucy's warbler (*Vermivora luciae*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, Lucy's warbler is an indicator species for low-elevation riparian habitat (USDA 1987a, p.134). Lucy's warbler breeds from extreme southeastern California and northeastern Baja California, east to central New Mexico, extreme western Texas, and northern Chihuahua (see Figure 1). Its ranges extends north into southern Utah, Nevada and possibly Colorado. Lucy's warblers are considered short-distance migrants, wintering in central western Mexico, south to Jalisco and Guerrero (Latta et al. 1999).

Lucy's warblers feed primarily on insects, foraging in foliage and flowers. Lucy's warblers breed in some of the densest concentrations of any noncolonial nesting species in North America (Latta et al. 1999) and breeding most often occurs in dense lowland riparian woodlands (Johnson et al. 1997). Nests are usually well concealed and found in deserted tree cavities and verdin nests, behind bark, among roots, along riverbanks or in other natural cavities (Johnson et al. 1997). Females do most of the nest building. Clutch size is typically four to five, and two broods per season are possible (NatureServe 2005). Brood parasitism by brown-headed cowbirds (*Molothrus ater*) may affect dwindling populations (Johnson et al. 1997).

In Arizona, nesting is known to occur as high as 6,500 ft (Latta et al. 1999) but most nesting occurs below 4,000 ft (Johnson et al. 1997). Phillips et al. (1964) noted that this species also breeds along low rivers north of the Mogollon Plateau (Little Colorado River watershed) although Johnson et al. (1997) note that as a species the Lucy's warbler nests "almost entirely in the hot lower Sonoran desert" of the US and Mexico and Latta et al. (1991) note that dense mesquite is the preferred habitat.

Management Activities or Natural Events That May Affect Habitat

Negative: Loss of habitat through conversion to agriculture or residential use, wood cutting, modifications of stream flows, and overgrazing in riparian areas.

Positive: Proper management of livestock grazing in riparian areas, maintenance of natural stream flow regimes, and stream and riparian restoration efforts.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

In the Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), specific "Standards and Guidelines" that apply to riparian areas in Management Area 3 include:

- Maintain riparian and meadow communities by providing waters for livestock and wildlife away from sensitive riparian areas.
- Manage for and maintain at least 60% of the woody plant composition in three or more riparian species. Manage for and maintain at least three age classes of riparian woody plants with at least 10% of the woody plant cover in sprouts, seedlings, and saplings.
- Manage for and maintain at least 60% near-natural shrub and tree crown cover.

- Amendment 1 - Give preferential consideration to riparian area dependent resources in cases of unsolvable conflicts. Manage to maintain or improve riparian areas to satisfactory riparian condition [defined in glossary, page 277-1]. Other resource uses and activities may occur to the extent that they support or do not adversely affect riparian dependent resources.

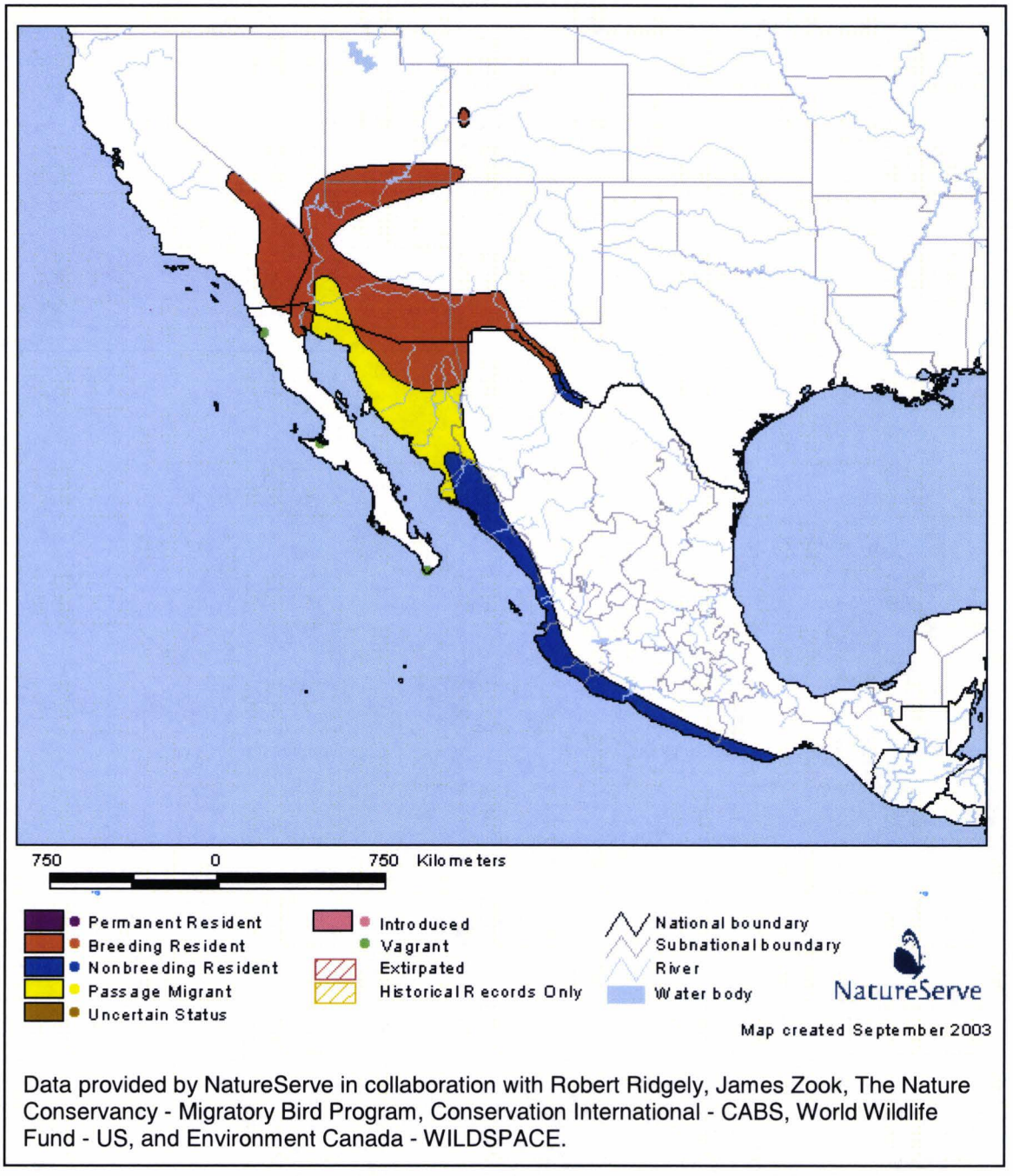

Figure 1. Range map for Lucy's warbler in North America (Ridgely et al. 2003).

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat features for which this species was selected as a management indicator species was low-elevation riparian. In Arizona, Lucy's warbler is a common resident of low- elevation riparian habitat (Latta et al. 1999), arriving in Arizona by late March (NatureServe 2005). It is an abundant summer resident in dense mesquite bosques and cottonwood-mesquite associations of the Lower Sonoran Zone (Phillips et al. 1964, Monson and Phillips 1981). In a 1981 survey of about 10 miles along the San Francisco River, Carothers et al. (1982) mapped areas of "riparian scrub woodland" dominated by varying amounts of mesquite. Known mesquite bosque habitat in the Forests occurs along the San Francisco River below its confluence with the Blue River and along a portion of Right Prong of Dix Creek named Mesquite Flat.

Lucy's warbler is fairly common in willow-ash-walnut-sycamore-live oak associations of the Upper Sonoran Zone (Phillips et al. 1964, Monson and Phillips 1981). This zone occurs at mid-elevations in most of southern and central Arizona including below the Mogollon Rim. During a 2002 survey, Oliver et al. found many areas supporting this type of vegetation along the lower Blue River, lowermost Eagle Creek, and the upper San Francisco River in the Clifton Ranger District located below the Mogollon Rim.

Without specifying vegetation type, Hubbard and Wayward (1973) noted Lucy's warbler as "fairly common" along the length of the San Francisco River between Glenwood, NM and Clifton, AZ in 1973, while Carothers et al. (1982) found Lucy's warblers in "relative low numbers" along the river from the Martinez Ranch east to the state line (Greenlee County). In Apache County, Rosenberg and Terrill (1986) indicate Lucy's warbler as "irregular" and low in numbers.

The Forest Plan EIS lists a total of 10,101 acres of riparian habitat. Riparian areas below the Mogollon Rim are considered low elevation. In the late 1980s, grazing by livestock and elk were resulting in adverse impacts to riparian habitat in the Forests (USDA Forest Service 1987a). Six of the 25 major watersheds in the Forest were considered to be in unsatisfactory conditions due primarily to inadequate vegetative ground cover. An estimated 34% of the Forest was in treatable unsatisfactory watershed condition. Deteriorated areas were discussed as having an absence of shrubs or trees or a lack of regeneration along stream banks. Stream banks were described as unstable with elevated stream temperatures, reduced aquatic diversity, depleted fish habitat, and extremely limited terrestrial wildlife habitat. The EIS cited excessive livestock grazing as the primary cause of failure of riparian areas to improve naturally.

Since the Forest Plan was approved, actions have been taken to improve low-elevation riparian conditions. The number of livestock animal unit months (AUMs) in the Forests has been reduced significantly and several riparian areas have been excluded from livestock grazing. Cattle have been excluded from low-elevation riparian areas along the Blue River, San Francisco River and Eagle Creek since the 1993 and 1995 floods. The recovery of riparian vegetation has been dramatic (see Figure 2). These areas now support multi-storied stands of Fremont cottonwood, Arizona sycamore, Arizona alder, Arizona black walnut, several willows, netleaf hackberry, and oak species. Herbaceous species composition has shifted from a corridor dominated by bermuda grass and upland grass species to a variety of mesic grass species along with rushes, sedges, and cattails along the wetted riparian zone. The riparian species exhibit high vigor but are

limited by poor age class distribution within the woody community. Middle-aged trees are noticeably absent from the system.

In 2000, the National Riparian Service Team (NRST) traveled to the Apache-Sitgreaves NF to provide technical assistance on riparian and fish habitat management in the Blue River and its watershed. The objectives were to assess current condition, assess potential, provide management recommendations, and provide opinion on realistic timeframes for recovery. The report cited four long-standing problems including 1) removal of large wood, 2) continuous year-long grazing, 3) road construction and maintenance, and 4) channelization and diking. While all of these problems have been eliminated or reduced on National Forest lands in the Blue River watershed, some, if not all appear to be continuing on private lands. The NRST reported that despite near complete destabilization of the Blue River historically, there is remarkable evidence of recovery on National Forest lands (USDA Forest Service 2001). Cottonwood and willow regeneration is doing well on upper reaches. One segment was reported as functioning properly. At least three age classes of vegetative recruitment were seen in some reaches including willow, cottonwood, and sycamore.

Figure 2. Eagle Creek riparian corridor in 2005.

Based on the information available, **habitat quality in low-elevation riparian areas is fair to good with an upward trend (USDA Forest Service 2001).** Most major low-elevation riparian drainages show good recovery from historic impacts. However, conditions are likely still below potential. See Appendix A for more information on low-elevation habitat trend.

POPULATION TREND

NatureServe Explorer (2005) provides an overview of the status of Lucy's warbler. Throughout its range, the species is considered secure (Heritage Global Status Rank G5, National Status Rank N5B) and in Arizona and New Mexico it is considered secure (S5) and apparently secure (S4), respectively. However, it is considered imperiled (S2) in California and vulnerable (S3) in Nevada, Utah and Texas (see Figure 3). Impacts have included loss of habitat through conversion to agriculture or residential use, wood

cutting, and modifications of stream flows (Latta et al. 1991). The population trend for Lucy's warbler in the US is -0.48 (p=0.59680) (Sauer et al. 2004). Figure 4 displays population trend data for the species across its range.

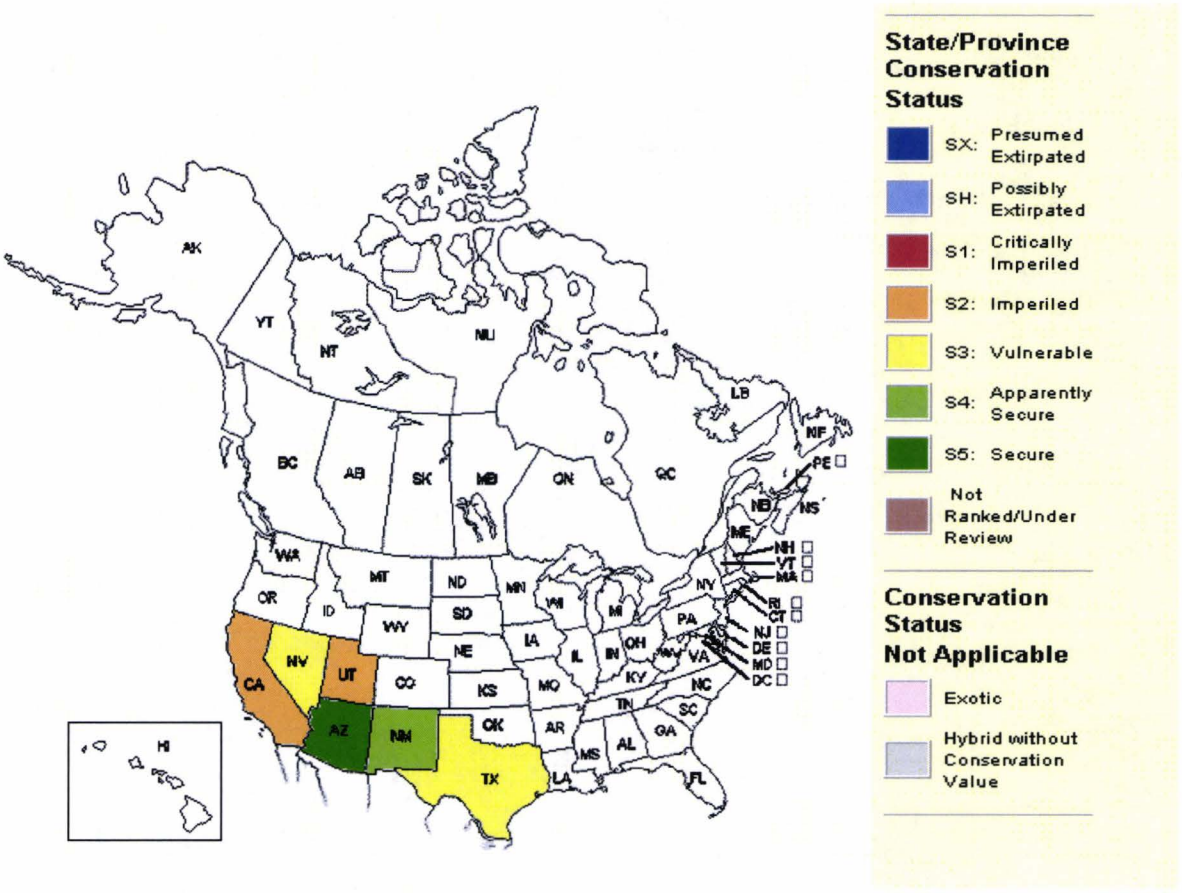

Figure 3. Distribution map of Lucy's warbler in North America displaying conservation status by state (NatureServe 2005).

Arizona

Sauer et al. (2004) report between 1966 and 2003 there was no significant population trend (-0,54, p=0.555642) for the Lucy's warbler in Arizona (see Figure 4). Similarly, analysis of data from Arizona between the years 1980 and 2003, detected no significant change in breeding Lucy's warbler populations (-1.06%, p=0.50185, n=30). These trend estimates are summaries of the population change over the last 37 and 23 years respectively, and do not provide information on other patterns of population change

(such as cycles) over time. Thirty survey routes[1] were used in this analysis, and the relative abundance of Lucy's warblers observed per route was 10.65. These results corroborate the stable trend seen in the nationwide data above.

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The Lucy's warbler was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). The Arizona Partners in Flight also lists a statewide population objective for the Lucy's warbler as "Maintain current statewide population of 850,000 individuals".

The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort did not identify the Lucy's warbler as a species of concern in this region.

Apache-Sitgreaves National Forest

The Lucy's warbler is considered an uncommon summer resident of the Apache-Sitgreaves NF (USDA Forest Service 1996), as well as the adjacent Gila NF (USDA Forest Service 1997).

The Arizona Game and Fish Department surveyed a portion (i.e., 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Sixty-five 1/6th-quadrangles occurred on ASNF lands. Breeding Lucy's warblers were detected in four of these 1/6th-quandrangles; once each in 1995 and 1997 and twice in 1998 (see Figure 6). All of these sectors occur at the lowest elevations in forests in the Clifton Ranger District. The biotic community noted for the 1995, 1997 and one of the 1998 detections is interior-riparian-deciduous forest and woodland that includes sycamore, cottonwood, willow and others. The other 1998 detection (adult carrying food) noted the biotic community of Sonoran-riparian-deciduous forest and woodland that is primarily cottonwood, willow, and mesquite. A mesquite bosque occurs on the San Francisco River just below its confluence with the Blue River; this bosque would likely have been included within this latter sector.

Five BBS routes are represented on the Apache-Sitgreaves National Forests. From 1966 to 2000, no Lucy's warblers were detected; however, these routes do not occur in the low-elevation riparian habitats typical for this bird. Sauer et al. (2001) provides an analysis of population trends of Lucy's warblers (see Figure 5). From 1985 through 2000, based on Breeding Bird Survey routes elsewhere in Arizona, the population of Lucy's warbler exhibits a slightly negative but insignificant trend (-1.76, p=.159, n=31 routes). However, the US Geological Survey (who has processed this data) indicates that the data used in this analysis contain an important deficiency and cautions against interpreting these results.

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[1] Numbers reflect the abundance of the species near the survey route. They are averages of the total counts along the route for the period 1989-1998. Because each survey route is 24.5 mi long, and consists of 50, 3-minute counts along the length of the route, the abundance estimate represents the number of birds that a very good birder would encounter in about 2.5 hours of roadside birding in the area near the BBS route (Sauer et al. 2004).

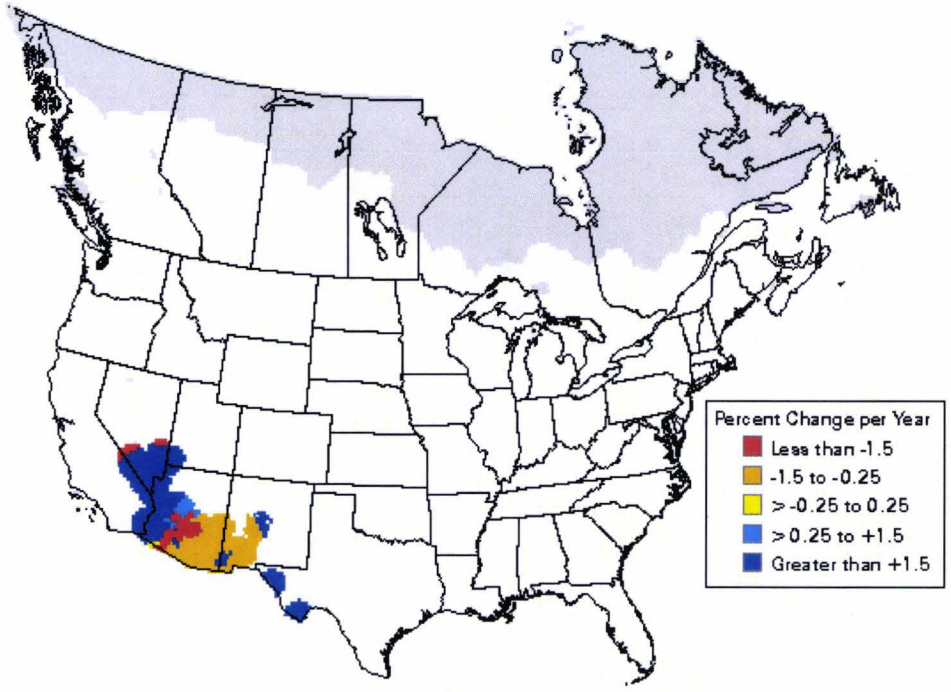

Figure 4. Breeding Bird Survey population trend map for the Lucy's warbler from 1966-2003 (Sauer et al. 2004)

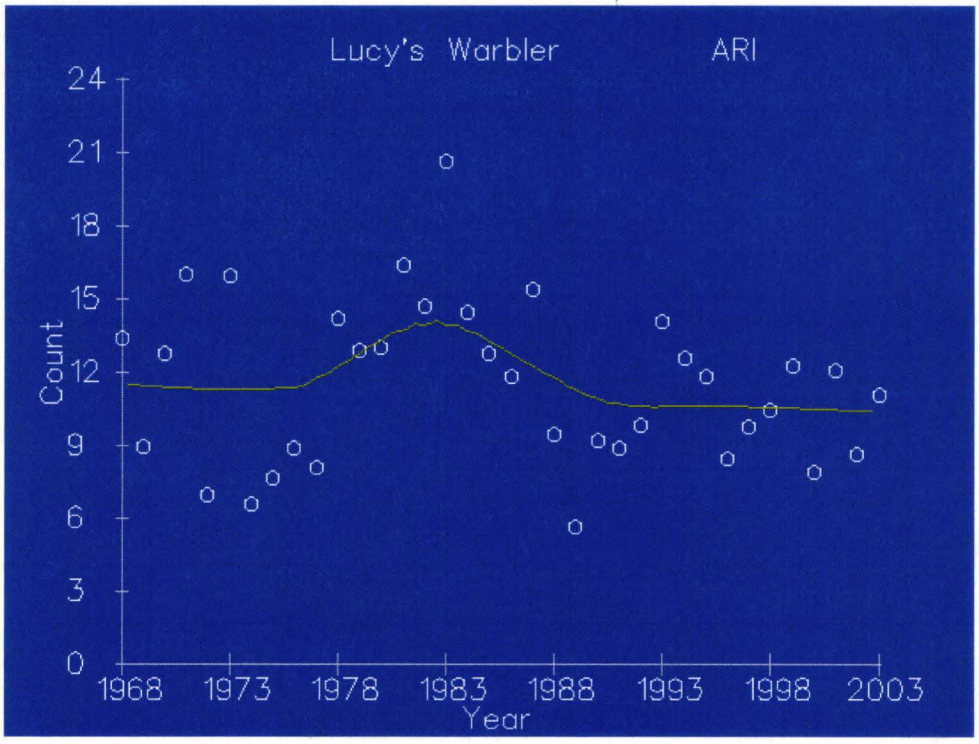

Figure 5. Estimated population trend for the Lucy's warbler in Arizona from 1966-2003 (Sauer et al. 2004).

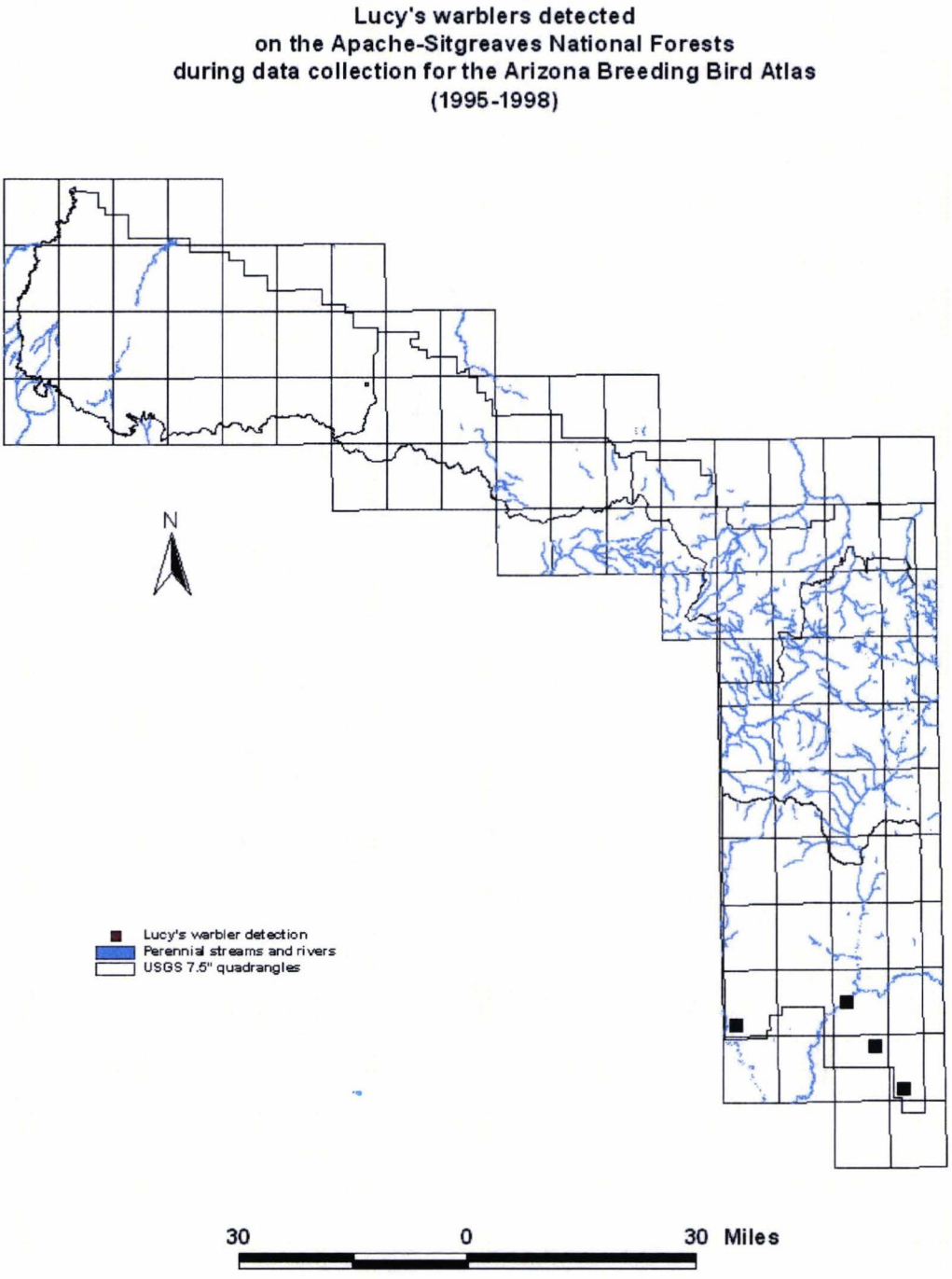

Figure 6. Distribution of Lucy's warbler detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of pinyon-juniper and juniper woodlands.

Recent surveys (2003) for southwest willow flycatchers were conducted along riparian areas associated with the Blue and San Francisco Rivers, as well as Eagle Creek in the

Clifton RD. All bird species encountered during the surveys were recorded. However, no Lucy's warblers were detected.

Taking into account the rare occurrence of the Lucy's warbler across the Forest in suitable habitat, the rarity of mesquite across the Forest, improving trends for low elevation riparian habitat in the Forest, and the overall stable population trend across Arizona, it appears that the Forest supports very little habitat capable of maintaining well distributed reproducing populations of this species. **Currently, Lucy's warbler populations in the Apache-Sitgreaves National Forest are considered stable, and likely near potential.** However, habitat potential is very low despite improving trends in the low elevation riparian areas due to the general lack of mesquite bosques, the preferred habitat of this species. Lucy's warbler does not appear to act as an MIS for low-elevation riparian habitat since its populations have not increased with improving condition of this habitat type. Other bird species appear to be better associated with the low-elevation riparian habitats that occur in the Forests.

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Forest Level Aquatic Macroinvertebrate Status Summary

Apache-Sitgreaves National Forests

Forest Plan Direction

The Apache-Sitgreaves National Forests Plan (Forest Plan) provides for the emphasis of riparian areas by outlining specific goals, objectives, and standards and guidelines. One of the objectives for Management Area 3 (riparian areas) is to manage for several indicator species, with one of these being aquatic macroinvertebrates. The standards and guidelines for aquatic macroinvertebrates for Priority 1 and 2 Riparian Areas are to manage for and maintain at least an 80 Biotic Condition Index (BCI) on all perennial streams.

The Forest Plan monitoring requirements are located in Table 14. For each activity, practice, or effect to be monitored, one or more measurement techniques and the expected future condition to be met are specified. Page 244 and 244a, which occur within Table 14 contain the information regarding aquatic macroinvertebrate monitoring. The intent of monitoring is to indicate whether aquatic habitat effectiveness is either in a maintenance or improvement phase. The method will be systematic field sampling (modified Surber sampling), with the unit of measure being the BCI. Monitoring will occur every 2-5 years on improved streams identified in the riparian plan, and every five years on Priority One and Two Streams. Variability that would initiate re-evaluation would occur when the BCI falls below 80% (Good), and/or the Habitat Condition Index (HCI) falls below 60%.

The Fisheries and Riparian Habitat Improvement for the Apache-Sitgreaves National Forests Implementation Plan (Forest Riparian Plan) provides the rationale, methods, and locations for aquatic macroinvertebrate sampling on the Forests. The specific streams designated for sampling are the Little Colorado River at the Forest Boundary, Black River at Wildcat Crossing, Blue River at Juan Miller Campground, and Chevelon Creek at Chevelon Crossing.

Monitoring Accomplishments

The only aquatic macroinvertebrate sampling that has been accomplished on the four streams mentioned in the previous paragraph occurred on Chevelon Creek at Chevelon Crossing in November 1996. This sample was collected for the General Aquatic Wildlife System (GAWS) survey, and a BCI was not calculated.

From 1989 through 2002, 35 streams on the Forests had a total of 239 aquatic macroinvertebrate samples collected in conjunction with GAWS surveys. Thirty-three of these samples were analyzed by the USDA – Forest Service, Aquatic Ecosystem Analysis Laboratory and 203 by the U.S.D.I. Bureau of Land Management, National Aquatic

Monitoring Center; and reports were provided to the Forests in 1987, 1990, and 1991, and 2004. This information is summarized below in Table 1 and is also provided in greater detail in Appendix A.

Table 1. Macroinvertebrate data collected on the Apache-Sitgreaves National Forests from 1986 through 2002. Summarized by stream, with the percentage of stream meeting or not meeting Forest Plan standards for the Biological Condition Index (BCI) rating.

Stream	BCI > 79	BCI < 80	Meeting (%)	Not Meeting (%)
Auger Canyon Creek	6	3	67	33
Bear Wallow Creek	0	3	0	100
Benton Creek	3	3	50	50
Billy Creek	0	9	0	100
Black River, N. Fork	No data			
Black River, W. Fork	1	2	33	67
Campbell Blue River	3	6	33	67
Chevelon Creek	No data			
Chitty Creek	No data			
Coleman Creek	0	3	0	100
Colter Creek	6	0	100	0
Coyote Creek	0	3	0	100
Hannagan Creek	1	2	33	67
Hayground Creek	0	3	0	100
Home Creek	0	3	0	100
Lee Valley Creek	8	0	100	0
Little Colorado River, E. Fork	7	1	88	13
Little Colorado River, S. Fork	0	6	0	100
Little Colorado River, W. Fork	3	0	100	0
Mamie Creek	1	2	33	67
Milk Creek	3	3	50	50
Nutrioso Creek	No data			
Paddy Creek	1	5	17	83
Porter Creek	0	7	0	100
Reservation Creek	0	3	0	100
Rudd Creek	No data			
Show Low Creek	3	6	33	67
Silver Creek	3	6	33	67
Snake Creek	0	3	0	100
Soldier Creek	0	3	0	100
Stinky Creek (1989)	1	0	100	0
Stinky Creek (1995)	1	8	11	89

Walnut Creek	No data			
Willow Creek	No data			
Willow Springs Creek	0	3	0	100

Results of Sampling

Table 2 below summarizes the 35 streams sampled listed in Table 1 above. Seven (20%) of the streams did not have a BCI calculated, and a total of 28 (80%) streams had the BCI calculated at 156 sites. Three streams (9%) of the samples collected were meeting LRMP standards, 13 (37%) were not meeting LRMP standards, and 12 streams (34%) had mixed results (i.e., some reaches were meeting and some were not). rated good, and 42 (27%) rated excellent. Both good and excellent ratings are at a 80 BCI or above, and are considered meeting Forest Plan standards. Those sites meeting or exceeding Forest Plan standards comprised 34% of the total, and those sites not meeting Forest Plan standards occurred at 66% of the sampled locations.

Table 2. Macroinvertebrate data collected on the Apache-Sitgreaves National Forests from 1986 through 2002. Summarized by streams that are meeting, not meeting, or have mixed results for the Biological Condition Index (BCI) rating.

Stream	# of streams	% of total	% of streams with BCI data
Streams meeting LRMP standard	3	9	11
Streams not meeting LRMP standard	13	37	46
Streams with mixed results	12	34	43
Streams with no BCI calculated	7	20	0

Monitoring and Evaluation Reports

In October of 1992 the final draft of the MAP to implement Chapter Five of the Forest Plan was completed, with the first annual monitoring and evaluation report to be prepared in fiscal year 1993. Priority One items were to be monitored in fiscal years 1993 and 1994. Priority One items are monitoring that is necessary to meet law or regulation; key Forests commitments; or where the monitoring effort would determine excellent and key resource condition status. Aquatic macroinvertebrate sampling is Monitoring Item #12, and is a priority one item. Three Monitoring and Evaluation Reports have been completed, covering fiscal years 1997, 1998, and 1999.

Regarding aquatic macroinvertebrates the following was reported in 1997:

- Little specific monitoring has occurred on the A/S relative to aquatic macroinvertebrates.

- Data has also been gathered on the Alpine R.D. to indicate that the following streams or stream reaches have a Biotic Condition Index (BCI) of less than 80.
- A BCI of 80 is felt to be a break point at which macroinvertebrates are impacted to the extent that fish species may not have self sustaining populations.
- Bear Wallow Creek (All Reaches), Coleman Creek (All Reaches), Corduroy Creek (Reach 2), Coyote Creek (All Reaches), Fish Creek (Reach 3), Hannagan Creek (All Reaches), Home Creek (All Reaches), Mamie Creek (Reach 2), Snake Creek (All Reaches), and Soldier Creek (All Reaches).
- Best Management Practices (BMPs) are adhered to in project planning and implementation but little or no specific aquatic macroinvertebrate surveys or monitoring is occurring on a project basis.
- It is suspected that long term cumulative effects may be increasing sediment loading resulting in long term losses of invertebrates and changes in stream morphology on some streams or stream reaches.

Regarding aquatic macroinvertebrates the following was reported in 1998:

- Macroinvertebrate samples were collected in cooperation with Arizona Game and Fish Department this year.
- The results of these samples have not yet been processed through the laboratory.

Regarding aquatic macroinvertebrates the following was reported in 1999:

- Macroinvertebrates samples were not collected this year but are scheduled for collection in FY 2000.

Aquatic Macroinvertebrate Status

One objective of Forest Plan is to continually monitor aquatic macroinvertebrates over time to determine the trend from the BCI and take appropriate action when goals, objectives, and standards are not being met. The East Fork Little Colorado River and Stinky Creek are the only two streams on the Forests that have had aquatic macroinvertebrate samples collected twice, and the trend for these two streams cannot be determined from the samples collected. Due to the lack of implementation of Monitoring Item #12 within the MAP, trend for aquatic macroinvertebrates cannot be determined using the BCI. However, we do know based on the sampling in support of the GAWS surveys, that 86% of those streams where macroinvertebrate data has been collected were not meeting Forests Plan standards.

Another Priority One item to monitor within the MAP and Forest Plan in conjunction with aquatic macroinvertebrates is aquatic and riparian habitat using the GAWS survey. The intent of this monitoring is to also maintain and/or improve aquatic habitat effectiveness, and a HCI below 60% would be below Forest Plan standards. Many of the streams on the Forests, although primarily on the Alpine and Springerville Ranger Districts, have had repeat surveys using the GAWS survey methodology. These data show that approximately 70% of the stream reaches surveyed are below the Forest Plan standard of 60% for the Habitat Condition Index (HCI). On streams where a second

survey has occurred, decreases in the HCI have occurred on approximately 70% of the stream reaches surveyed. These repeat surveys conducted by the Arizona Game and Fish Department have also shown significant decreases (approximately 75%) in Apache trout numbers from previous surveys.

The Forest Riparian Plan states, "The Forest estimates (see Forest Plan) that currently 72 percent of the riparian forest is in unsatisfactory condition." The three annual monitoring and evaluation reports discussed above provide no rationale or data that would allow one to conclude or infer that the percent of unsatisfactory riparian conditions has changed since implementation of the Forest Plan.

Considering the information that has been collected and summarized above, personal observations regarding watershed conditions and hydrologic function and processes across the Forests; I would conclude based on the GAWS, HCI, BCI, and fish population information that aquatic/riparian habitat conditions and therefore aquatic macroinvertebrate populations and habitat are in a downward trend on the Forests.

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Appendix A. Macroinvertebrate data collected on the Apache-Sitgreaves National Forests from 1986 through 2002.

Stream	Sample ID	Sampling Date	BCI/Rating
Auger Canyon Creek	Site 125	November 20, 1995	79 Fair
Auger Canyon Creek	Site 126	November 20, 1995	77 Fair
Auger Canyon Creek	Site 127	November 20, 1995	73 Fair
Auger Canyon Creek	Site 128	November 20, 1995	111 Excellent
Auger Canyon Creek	Site 129	November 20, 1995	80 Good
Auger Canyon Creek	Site 130	November 20, 1995	89 Excellent
Auger Canyon Creek	Site 131	November 20, 1995	99 Excellent
Auger Canyon Creek	Site 132	November 20, 1995	100 Excellent
Auger Canyon Creek	Site 133	November 20, 1995	107 Excellent
Bear Wallow Creek	F1-1-1	October 22, 1990	70 Poor
Bear Wallow Creek	F1-10	October 23, 1990	79 Fair
Bear Wallow Creek	F5-43	October 23, 1990	73 Fair
Benton Creek	Site 134	November 16, 1995	70 Poor
Benton Creek	Site 135	November 16, 1995	57 Poor
Benton Creek	Site 136	November 16, 1995	67 Poor
Benton Creek	Site 137	November 16, 1995	123 Excellent
Benton Creek	Site 138	November 16, 1995	116 Excellent
Benton Creek	Site 139	November 16, 1995	131 Excellent
Benton Creek	Site 140	November 16, 1995	Not Calculated
Benton Creek	Site 141	November 16, 1995	Not Calculated
Benton Creek	Site 142	November 16, 1995	Not Calculated
Billy Creek	Site 143	December 15, 1998	56 Poor
Billy Creek	Site 144	December 15, 1998	53 Poor
Billy Creek	Site 145	December 15, 1998	56 Poor
Billy Creek	Site 146	December 15, 1998	54 Poor
Billy Creek	Site 147	December 15, 1998	57 Poor
Billy Creek	Site 148	December 15, 1998	55 Poor
Billy Creek	Site 149	December 15, 1998	62 Poor

Billy Creek	Site 150	December 15, 1998	60 Poor
Billy Creek	Site 151	December 15, 1998	60 Poor
North Fork Black River	Site 152	December 15, 1998	Not Calculated
North Fork Black River	Site 153	October 31, 2001	Not Calculated
North Fork Black River	Site 154	October 31, 2001	Not Calculated
North Fork Black River	Site 155	October 31, 2001	Not Calculated
North Fork Black River	Site 156	October 31, 2001	Not Calculated
North Fork Black River	Site 157	October 31, 2001	Not Calculated
North Fork Black River	Site 158	November 24, 2001	Not Calculated
North Fork Black River	Site 159	November 24, 2001	Not Calculated
North Fork Black River	Site 160	November 24, 2001	Not Calculated
West Fork Black River	F1-1	November 2, 1989	68 Poor
West Fork Black River	F4-30	November 1, 1989	75 Fair
West Fork Black River	FS/R.B.	November 15, 1989	81 Good
Campbell Blue River	Site 161	November 20, 1995	83 Excellent
Campbell Blue River	Site 162	November 20, 1995	81 Good
Campbell Blue River	Site 163	November 29, 1995	85 Excellent
Campbell Blue River	Site 164	November 29, 1995	53 Poor
Campbell Blue River	Site 165	November 29, 1995	54 Poor
Campbell Blue River	Site 166	November 29, 1995	54 Poor
Campbell Blue River	Site 167	November 29, 1995	46 Poor
Campbell Blue River	Site 168	November 29, 1995	48 Poor
Campbell Blue River	Site 169	November 29, 1995	47 Poor
Chevelon Creek	Site 170	November 5, 1996	Not Calculated
Chevelon Creek	Site 171	November 5, 1996	Not Calculated
Chevelon Creek	Site 172	November 5, 1996	Not Calculated
Chevelon Creek	Site 173	November 5, 1996	Not Calculated
Chevelon Creek	Site 174	November 5, 1996	Not Calculated
Chevelon Creek	Site 175	November 5, 1996	Not Calculated
Chitty Creek	Site 176	October 20 1998	Not Calculated
Chitty Creek	Site 177	October 20, 1998	Not Calculated
Chitty Creek	Site 178	October 20, 1998	Not Calculated
Chitty Creek	Site 179	October 20, 1998	Not Calculated
Chitty Creek	Site 180	October 20, 1998	Not Calculated
Chitty Creek	Site 181	October 20, 1998	Not Calculated
Chitty Creek	Site 182	October 20, 1998	Not Calculated
Chitty Creek	Site 183	October 20, 1998	Not Calculated
Chitty Creek	Site 184	October 20, 1998	Not Calculated
Coleman Creek	F1-1	October 31, 1990	75 Fair
Coleman Creek	F4-28	October 31, 1990	79 Fair
Coleman Creek	F3-19	October 31, 1990	66 Poor
Colter Creek	Site 185	November 20, 1995	98 Excellent
Colter Creek	Site 186	November 20, 1995	93 Excellent
Colter Creek	Site 187	November 20, 1995	104 Excellent

Colter Creek	Site 188	November 27, 1995	143 Excellent
Colter Creek	Site 189	November 27, 1995	123 Excellent
Colter Creek	Site 190	November 27, 1995	129 Excellent
Colter Creek	Site 191	November 27, 1995	Not Calculated
Colter Creek	Site 192	November 27, 1995	Not Calculated
Colter Creek	Site 193	November 27, 1995	Not Calculated
Coyote Creek	1-2	November 6, 1990	72 Fair
Coyote Creek	F3-20	November 6, 1990	63 Poor
Coyote Creek	F6-33	November 19, 1990	61 Poor
Hannagan Creek	F1-1	October 25, 1990	72 Fair
Hannagan Creek	F3-14	October 25, 1990	83 Good
Hannagan Creek	F4-25	October 25, 1990	72 Fair
Hayground Creek	1-1	October 30, 1989	77 Fair
Hayground Creek	2-4	October 30, 1989	78 Fair
Hayground Creek	3-8	October 30, 1989	58 Fair
Home Creek	3-12	November 7, 1989	72 Fair
Home Creek	6-28	November 7, 1989	67 Poor
Home Creek	9-47	November 7, 1989	57 Poor
Lee Valley Creek	Site 194	November 17, 2001	89 Excellent
Lee Valley Creek	Site 195	November 17, 2001	83 Excellent
Lee Valley Creek	Site 196	November 17, 2001	116 Excellent
Lee Valley Creek	Site 197	November 17, 2001	100 Excellent
Lee Valley Creek	Site 198	November 17, 2001	92 Excellent
Lee Valley Creek	Site 199	November 17, 2001	140 Excellent
Lee Valley Creek	Site 200	November 17, 2001	140 Excellent
Lee Valley Creek	Site 201	November 17, 2001	133 Excellent
East Fork Little Colorado River	Site 202	November 16, 2002	102 Excellent
East Fork Little Colorado River	Site 203	November 16, 2002	99 Excellent
East Fork Little Colorado River	Site 204	November 16, 2002	93 Excellent
East Fork Little Colorado River	Site 205	November 16, 2002	85 Excellent
East Fork Little Colorado River	Site 206	November 16, 2002	81 Good
East Fork Little Colorado River	Site 207	November 16, 2002	79 Fair
East Fork Little Colorado River	Site 208	November 16, 2002	120 Excellent
East Fork Little Colorado River	Site 209	November 16, 2002	103 Excellent
East Fork Little Colorado River	Site 210	November 16, 2002	103 Excellent
South Fork Little Colorado River	Site 211	October 31, 2002	65 Poor
South Fork Little Colorado River	Site 212	October 31, 2002	65 Poor
South Fork Little Colorado River	Site 213	October 31, 2002	64 Poor
South Fork Little Colorado River	Site 214	October 16, 2002	68 Poor
South Fork Little Colorado River	Site 215	October 16, 2002	70 Poor
South Fork Little Colorado River	Site 216	October 16, 2002	67 Poor
South Fork Little Colorado River	Site 217	October 16, 2002	Not Calculated
South Fork Little Colorado River	Site 218	October 16, 2002	Not Calculated
South Fork Little Colorado River	Site 219	October 16, 2002	Not Calculated

West Fork Little Colorado River	Site 220	November 19, 2001	Not Calculated
West Fork Little Colorado River	Site 221	November 19, 2001	Not Calculated
West Fork Little Colorado River	Site 222	November 19, 2001	Not Calculated
West Fork Little Colorado River	Site 223	November 19, 2001	Not Calculated
West Fork Little Colorado River	Site 224	November 18, 2001	Not Calculated
West Fork Little Colorado River	Site 225	November 18, 2001	Not Calculated
West Fork Little Colorado River	Site 226	November 18, 2001	163 Excellent
West Fork Little Colorado River	Site 227	November 18, 2001	348 Excellent
West Fork Little Colorado River	Site 228	November 18, 2001	167 Excellent
Mamie Creek	F2-3	November 13, 1989	75 Fair
Mamie Creek	F2-10	November 13, 1989	76 Fair
Mamie Creek	F3-13	November 13, 1989	81 Good
Milk Creek	Site 229	November 30, 1995	61 Poor
Milk Creek	Site 230	November 30, 1995	72 Fair
Milk Creek	Site 231	November 30, 1995	63 Poor
Milk Creek	Site 232	November 28, 1995	Not Calculated
Milk Creek	Site 233	November 28, 1995	Not Calculated
Milk Creek	Site 234	November 28, 1995	Not Calculated
Milk Creek	Site 235	November 28, 1995	110 Excellent
Milk Creek	Site 236	November 28, 1995	94 Excellent
Milk Creek	Site 237	November 28, 1995	108 Excellent
Nutrioso Creek	Site 238	November 28, 1995	Not Calculated
Nutrioso Creek	Site 239	November 28, 1995	Not Calculated
Nutrioso Creek	Site 240	November 28, 1995	Not Calculated
Nutrioso Creek	Site 241	November 17, 1995	Not Calculated
Nutrioso Creek	Site 242	November 17, 1995	Not Calculated
Nutrioso Creek	Site 243	November 17, 1995	Not Calculated
Nutrioso Creek	Site 244	November 17, 1995	Not Calculated
Nutrioso Creek	Site 245	November 17, 1995	Not Calculated
Nutrioso Creek	Site 246	November 17, 1995	Not Calculated
Paddy Creek	Site 247	November 17, 1995	56 Poor
Paddy Creek	Site 248	November 17, 1995	67 Poor
Paddy Creek	Site 249	November 17, 1995	62 Poor
Paddy Creek	Site 250	November 20, 1995	82 Good
Paddy Creek	Site 251	November 20, 1995	79 Fair
Paddy Creek	Site 252	November 20, 1995	76 Fair
Porter Creek	Site 253	November 18, 1995	59 Poor
Porter Creek	Site 254	November 18, 1998	Not Calculated
Porter Creek	Site 255	November 18, 1998	Not Calculated
Porter Creek Site 264	Site 256	November 18, 1998	62 Poor
Porter Creek	Site 257	November 18, 1998	67 Poor
Porter Creek	Site 258	November 18, 1998	65 Poor
Porter Creek	Site 259	November 18, 1998	78 Fair
Porter Creek	Site 260	November 18, 1998	72 Fair

Porter Creek	Site 261	November 18, 1998	78 Fair
Reservation Creek	F1-1	November 2, 1989	72 Fair
Reservation Creek	F1-9	October 31, 1989	69 Poor
Reservation Creek	F1-15	November 2, 1989	72 Fair
Rudd Creek	Site 262	November 17, 1995	Not Calculated
Rudd Creek	Site 263	November 17, 1995	Not Calculated
Rudd Creek	Site 264	November 17, 1995	Not Calculated
Rudd Creek	Site 265	November 17, 1995	Not Calculated
Rudd Creek	Site 266	November 17, 1995	Not Calculated
Rudd Creek	Site 267	November 17, 1995	Not Calculated
Rudd Creek	Site 268	November 16, 1995	Not Calculated
Rudd Creek	Site 269	November 16, 1995	Not Calculated
Rudd Creek	Site 270	November 16, 1995	Not Calculated
Show Low Creek	Site 271	November 19, 1996	98 Excellent
Show Low Creek	Site 272	November 19, 1996	113 Excellent
Show Low Creek	Site 273	November 19, 1996	94 Excellent
Show Low Creek	Site 274	November 19, 1996	68 Poor
Show Low Creek	Site 275	November 19, 1996	63 Poor
Show Low Creek	Site 276	November 19, 1996	67 Poor
Show Low Creek	Site 277	November 19, 1996	78 Fair
Show Low Creek	Site 278	November 19, 1996	69 Poor
Show Low Creek	Site 279	November 19, 1996	72 Poor
Silver Creek	Site 280	November 5, 1997	61 Poor
Silver Creek	Site 281	November 5, 1997	68 Poor
Silver Creek	Site 282	November 5, 1997	65 Poor
Silver Creek	Site 283	November 5, 1997	71 Poor
Silver Creek	Site 284	November 5, 1997	73 Fair
Silver Creek	Site 285	November 5, 1997	71 Poor
Silver Creek	Site 286	November 5, 1997	80 Good
Silver Creek	Site 287	November 5, 1997	81 Good
Silver Creek	Site 288	November 5, 1997	86 Excellent
Snake Creek	F1-1	October 29, 1990	68 Poor
Snake Creek	F1-5	October 29, 1990	70 Poor
Snake Creek	F1-9	October 29, 1990	68 Poor
Snake Creek	Site 289	September 25, 2002	Not Calculated
Snake Creek	Site 290	September 25, 2002	Not Calculated
Snake Creek	Site 291	September 25, 2002	Not Calculated
Snake Creek	Site 292	September 25, 2002	Not Calculated
Snake Creek	Site 293	September 25, 2002	Not Calculated
Snake Creek	Site 294	September 25, 2002	Not Calculated
Snake Creek	Site 295	September 25, 2002	Not Calculated
Snake Creek	Site 296	September 25, 2002	Not Calculated
Snake Creek	Site 297	September 25, 2002	Not Calculated
Soldier Creek	F1-1	October 31, 1989	76 Fair

Soldier Creek	F2-7	October 31, 1989	75 Fair
Soldier Creek	F3-13	October 31, 1989	71 Poor
Stinky Creek	F1-1	November 1, 1989	83 Good
Stinky Creek	F3-11	November 1, 1989	
Stinky Creek	F4-20	November 1, 1989	
Stinky Creek	Site 298	November 1, 1995	76 Fair
Stinky Creek	Site 299	November 1, 1995	56 Poor
Stinky Creek	Site 300	November 1, 1995	70 Poor
Stinky Creek	Site 301	November 1, 1995	75 Fair
Stinky Creek	Site 302	November 1, 1995	78 Fair
Stinky Creek	Site 303	November 1, 1995	74 Fair
Stinky Creek	Site 304	November 1, 1995	73 Fair
Stinky Creek	Site 305	November 1, 1995	70 Poor
Stinky Creek	Site 306	November 1, 1995	93 Excellent
Walnut Creek	Site 307	November 10, 1997	Not Calculated
Walnut Creek	Site 308	November 10, 1997	Not Calculated
Walnut Creek	Site 309	November 10, 1997	Not Calculated
Walnut Creek	Site 310	November 10, 1997	Not Calculated
Walnut Creek	Site 311	November 10, 1997	Not Calculated
Walnut Creek	Site 312	November 10, 1997	Not Calculated
Willow Creek	Site 313	November 12, 1997	Not Calculated
Willow Creek	Site 314	November 12, 1997	Not Calculated
Willow Creek	Site 315	November 12, 1997	Not Calculated
Willow Springs Creek	Site 316	December 6, 1995	60 Poor
Willow Springs Creek	Site 317	December 6, 1995	61 Poor
Willow Springs Creek	Site 318	December 6, 1995	60 Poor
Willow Springs Creek	Site 319	December 7, 1995	Not Calculated
Willow Springs Creek	Site 320	December 7, 1995	Not Calculated
Willow Springs Creek	Site 321	December 7, 1995	Not Calculated
Woods Canyon Creek	Site 322	December 6, 1995	73 Fair
Woods Canyon Creek	Site 323	December 6, 1995	65 Poor
Woods Canyon Creek	Site 324	December 6, 1995	79 Fair
Woods Canyon Creek	Site 325	December 6, 1995	69 Poor
Woods Canyon Creek	Site 326	December 6, 1995	76 Fair
Woods Canyon Creek	Site 327	December 6, 1995	75 Fair

Updated September 26, 2007

Merriam's Turkey (*Meleagris gallopavo merriami*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the turkey is an indicator species for late-succession habitat (USDA 1987a, p.134). The Merriam's turkey (*Meleagris gallopavo merriami*) is one of five recognized subspecies of wild turkey. Merriam's has the widest distribution and is the most common of the subspecies. Also known as "wild" turkey, the Merriam's turkey is an omnivorous habitat generalist, migratory in parts of its range, and is able to utilize almost any habitat condition depending upon the given season and weather pattern. Hoffman et al., 1993 identified the subspecies as a bird of the western United States, originally occupying portions of Arizona, Colorado, and New Mexico. Aggressive state stocking programs were largely responsible for the re-establishment of Merriam's turkey into historical habitats and the expansion of historical range.

In Arizona, turkeys can be found not only in the ponderosa pine vegetation type, but also in riparian, deciduous, oak, and other vegetation types from 3,500 to 10,000 feet. They are found in mixed-conifer forests during summer, often near meadows. During winter, turkeys move down to the lower edges of the ponderosa pine, or pinyon-juniper habitats (Arizona Game and Fish 2004). According to Wakeling (1991), survival of adult hens has the greatest impact on population numbers. Wild turkey hens experience the highest level of mortality during winter months with severe winters contributing to fluctuations in population numbers (Leopold 1931, Porter et al. 1980).

Important habitat components for different behavioral activities within a given home range include areas for roosting, nesting, brooding, and loafing. Nesting cover, roost trees, wet meadows, and oak trees producing acorns are very important to turkeys. Turkeys must have a combination of trees and grasses. Trees provide food, daytime resting and escape cover, as well as nighttime roost sites. Grasses provide food and insects for poults and adults. However, turkeys are opportunistic feeders utilizing a wide array of food sources including seeds and leaves of grasses and forbs; fruits of shrubs and vines, mast of oak and pine including pinyon nuts, and animal foods such as insects and snails (Dickson 1992).

Nests are frequently found at the base of trees and in logging slash, shrub cover and herbaceous vegetation. Hens normally nest within ½-mile radius of water. Openings with adequate residual forage height and abundant insects are important to hens with broods. Young poults are heavily dependent on insects for the first couple of weeks and residual stubble height is important for cover.

Turkeys prefer to roost in tall, mature or over-mature ponderosa pines with relatively open crowns and large horizontal branches starting at six to nine meters (20-30 ft) from the ground. Trees with a diameter at breast height (DBH) of over 14 inches are used as roosts. Preferred roost sites are often located just below a ridgeline (Hoffman et al. 1993).

Management Activities or Natural Events That May Affect Habitat

Negative: Primarily related to long-term cumulative effects of forest succession after heavy logging, long-term fire suppression, some overstory removal prescriptions, drought and large wildfires.

Positive: Thinning of dense timber, patch clearcuts, water developments, road closures, prescribed fire and small wildfires.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), includes specific "Standards and Guidelines" that are expected to maintain or improve turkey habitat components in timberland, woodlands, riparian areas, and grasslands including:

Management Area 1 - Timberland

- Old growth – until the Forest plan is revised, allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement p. 122-2).
- Thermal cover for elk is a stand of coniferous forest tall and wide enough to allow animal movement and bedding with a high degree of crown closure. Emphasize maintaining thermal cover in known travelways and bedding areas.
- Provide a minimum of 2 down logs per acres (12" diameter or larger) or untreated slash piles 10-foot in diameter or a combination of down logs and slash piles over 55% of a diversity unit.
- Provide big game, nongame, and upland game habitat in aspen.
- Hiding cover is vegetation and topographical features capable of hiding 90 percent of a standing deer or elk from human view at a distance of 200 feet or less. Emphasize maintaining hiding cover adjacent to dependable water and key openings, along known travelways, and in pine stringers.
- Maintain turkey habitat.
- Defer slash treatment activities in turkey nesting areas from April 15 through June 30.
- Manage for turkey nesting cover through modified slash treatment. Leave scattered patches, at least ¼-mile in size, of untreated slash within ½-mile of dependable water in actual or potential turkey nesting areas.

Management Area 2 - Woodland

- Maintain or improve big game habitat. Limit created openings on big game winter range to no wider than 1,200 feet. Leave cover strips at least 500 feet wide between openings; openings are not to exceed 40 acres. Maintain no less than

the current level of openings on current antelope ranges. Emphasize openings adjacent to pine stringers.

- Manage areas that are harvested for fuelwood. Emphasize openings on existing and potential big game range. Retain thermal cover and hiding cover on north and east exposures. Manage fuelwood sales to break up large areas of single-age classes. Leave cavity excavated trees, shrubs, and oak in openings created for wildlife.
- Retain ponderosa pine stringers as inclusions.
- Manage for at least 20 percent of each diversity unit in thermal and hiding cover. Emphasize cover management in travelways, bedding areas, reproductive areas, and adjacent to key openings. Cover is managed to provide at least 60% crown cover and at least 500' wide.
- In treated stands, manage for small game and nongame by leaving an average of one slash pile per three acres in the woodland type or leave lopped and scattered slash on 30 percent of the area.

Management Area 3 – Riparian

- Maintain riparian and meadow communities by providing water for livestock and wildlife away from sensitive riparian areas.
- Manage for and maintain at least three age classes of riparian woody plants with at least 10% of the woody plant cover in sprouts, seedlings, and saplings.
- Manage for and maintain at least 60% near-natural shrub and tree crown cover.

Management Area 4 – Grasslands

- Evaluate need and construct fences where necessary to protect key meadows from grazing.
- When springs are developed in meadow communities, riparian areas, or other sensitive areas, protect these areas by piping the water to water developments in adjacent, less sensitive areas.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was late-succession habitat. The Forest Plan EIS defined old growth for various forest vegetation types (USDA Forest Service 1987b, p. 299) based on the number and size of large trees, multiple canopy layers, snags, and down logs. The EIS also mentioned that there were old growth deficits in the Sitgreaves NF (p. 229). The FEIS set the goal for late-succession wildlife habitat at 21% for Alternative D (p. 200). The age class distribution of timber from the Forest Plan EIS (p. 150) showed that in 1987, the Forest had about 87,331 acres (10.8%) in stands greater than 140 years old. The Forest Plan specified that 20% of each diversity unit is to be allocated old growth (USDA

Forest Service 1987a, p. 122-2). Therefore, the goal of the Forest Plan was to increase old-growth/late-succession habitat in the Forest.

Based on the 1996 Forest Inventory Assessment (FIA) data set, the "Habitat Quality Index Model" (HQI, version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for Merriam's turkey. The distribution (acres) of forest structure (e.g. vegetative structural stage, even/uneven age-class) by cover type was derived from the 1996 FIA data and analyzed by the Forest silviculturist. The HQI model recognized 936,663 acres of year-round habitat that provides some value for foraging and cover by turkeys. Coefficients for this model were specific to the vegetative structure of spruce-fir, mixed-conifer, ponderosa pine, and aspen cover types. The habitat quality index generated by this model indicates that the Forests, as of 1996, provide overall habitat at about 50-70% of its capability for Merriam's turkey. In descriptive terms, the model predicts that the Apache-Sitgreaves National Forests provide moderate, high-quality habitat for Merriam's turkey.

In 1996, the FIA data indicated that there were 308,535 (17.4%) acres of stands greater than 150 years old with 62,611 acres (3.5%) being 200 years or older. Based on this information, it appears that there has been an increase in the acres of older stands of trees. However, it is more likely that this difference in the number of acres of old trees is due to better data collection methods in use today versus at the time the Forest Plan was approved. FIA data is a forestwide sampling scheme that does not collect data on each forested stand but rather a stratified random sample of stands. The Forest does not have a complete forest inventory of what is current old growth based on stand exam data because stand exam data is not available for all areas of the Forest.

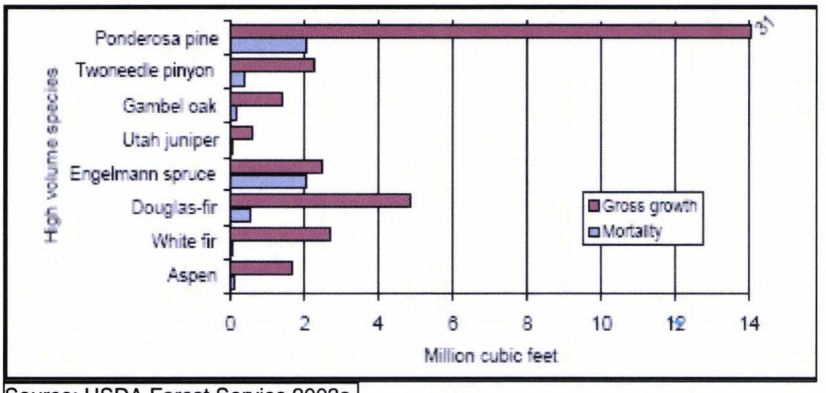
The Forest Plan requires designation of 20% of each forest cover type to be managed toward old growth. The Forest has done that on a project-by-project basis as vegetation treatments are planned. These designated old growth management stands are available in a GIS coverage. A total of 74,943 acres have been designated for late-succession vegetation across the Forests.

There are other factors to consider in making a determination of trend for late-succession habitat. Both natural and human events can affect forest succession. Timber harvest can reduce the amount of existing and developing late-succession habitat. The Forest Plan EIS considered effects to old growth in developing the Allowable Sale Quantity of timber authorized under each alternative. The Forest Plan authorized about 18,000 acres of timber harvest annually. The figure below depicts the levels of projected versus actual timber harvest over the life of the Forest Plan. Actual harvest information is from Forest records (Beal unpub. data). The projected harvest is based on the figure listed in the Forest Plan EIS for Alternative D of 18,080 acres annually (USDA Forest Service 1987b, p. 199). Actual harvest has varied considerably between years but has been declining overall as shown by the trend line in the graph below. The recent spike in timber harvest was due primarily to salvage harvest in the Rodeo-Chediski fire. As such, it doesn't truly represent a potential effect on late-succession habitat from timber harvest. The fire itself caused loss of old growth.

Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

Figure 1. Timber treatments in the Apache-Sitgreaves NF (1985-2006).

Another factor in the development of old growth across the Forest is the annual rate of forest growth. The FIA report (USDA Forest Service 2003a) discusses the net annual growth of trees in the Forest by comparing estimated gross annual growth and gross annual mortality. Total mortality is about 13% of total annual growth. Figure 2 compares gross annual growth to mortality for eight common forest types. Growth in most types, except Englemann spruce, far outstrips mortality in the Apache-Sitgreaves NF. Thus, the forest is getting older and thicker over time. This is another indication that late succession is continuing to develop in the Forest.



Source: USDA Forest Service 2003a.

Figure 2. Gross annual growth of live trees 5 inches diameter and greater compared to mortality on all forested land, Apache-Sitgreaves NF, 1996

As mentioned above, another event that can affect the amount and development of old growth is wildfire. Wildfire can destroy existing old growth and retard the development of future old growth by setting back forest succession. The Apache-Sitgreaves NF has sustained large wildfires since 2000. The largest of these was the Rodeo-Chediski fire of 2002. That fire burned 173,107 acres of the Apache-Sitgreaves NF. As discussed previously, the Sitgreaves portion of the Forest was deficit in old growth in 1987. Prior to the fire, only about 2% of the burned area was in "old-forest" conditions (USDA Forest Service 2003b). About half of this was lost in the fire. There were 324 stands comprising

26,546 acres that had been designated for old growth management within the burn perimeter. The 15,366 acres of this designated old growth that burned at high or moderate intensity are no longer considered appropriate for old growth management. On a Forestwide basis, the fire had only a very small effect on existing late-succession habitat. The fire had a somewhat greater effect on lands set aside for developing old growth.

In terms of dispersion of habitats for turkeys, the Rodeo-Chediski fire created a mosaic of openings and forested stands. The HQI model was used to evaluate the effects of the fire on turkey habitat. The model showed increases in forage and decreases in cover, which resulted in no change in overall quality of turkey habitat, rated at moderate quality (USDA Forest Service 2003b). Many of the fire-created openings are too large to be valuable as turkey habitat. Turkeys are seldom found more than 100-200 yards from tree cover.

Based on the information currently available **there appears to be an upward trend in the amount of late-succession habitat** due to protection of existing and potential old-growth areas, decreasing harvest levels, and high net annual growth rate. Fires appear to have had only a small negative effect. However, actual improvements in the quality of late succession management areas will take many decades. **The upward trend in habitat will be much slower.** The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

POPULATION TREND

The wild turkey (*Meleagris gallopavo*) is a wide-ranging species in North America (see Figure 1) (Natureserve 2005). Throughout its range, the species is considered secure (Heritage Global Status: G5; National Status Rank: N5; Arizona Status Rank: S5) (NatureServe Explorer 2005). Overall, the US population of turkeys is upward (13.75, p=0.0000, n=934) (Sauer et al. 2004). Figure 4 displays population trend data for the species across its range.

Arizona

Sauer et al. (2004) report between 1966 and 2003 there was no significant population trend (-23.36, p=0.15312) for the turkey in Arizona. However this data represents only two routes with an average of 0.07 birds seen per route. There are five Breeding Bird Survey transects in the Apache-Sitgreaves NF. Most of these routes have been surveyed annually since 1992. Turkeys were detected on only one of these five routes. Turkeys are not easily detected during Breeding Bird Surveys due to their shy nature and sensitivity to disturbance. They tend to be seen in large flocks or not at all, which creates large variability in the number of detections and adversely affects statistical rigor of trend analyses. Because these trend estimates are based on extremely small sample size, they should not be considered accurate. Sauer et al. (2004) report between 1966 and 2003 there was a nonsignificant upward population trend (+17.4, p=0.20, n=16) for the turkey in the Southern Rockies region (see Figure 4). Turkey populations on the Apache-Sitgreaves National Forest are highly variable by year, due to many weather-related factors (Arizona Game and Fish 1990, 2004).

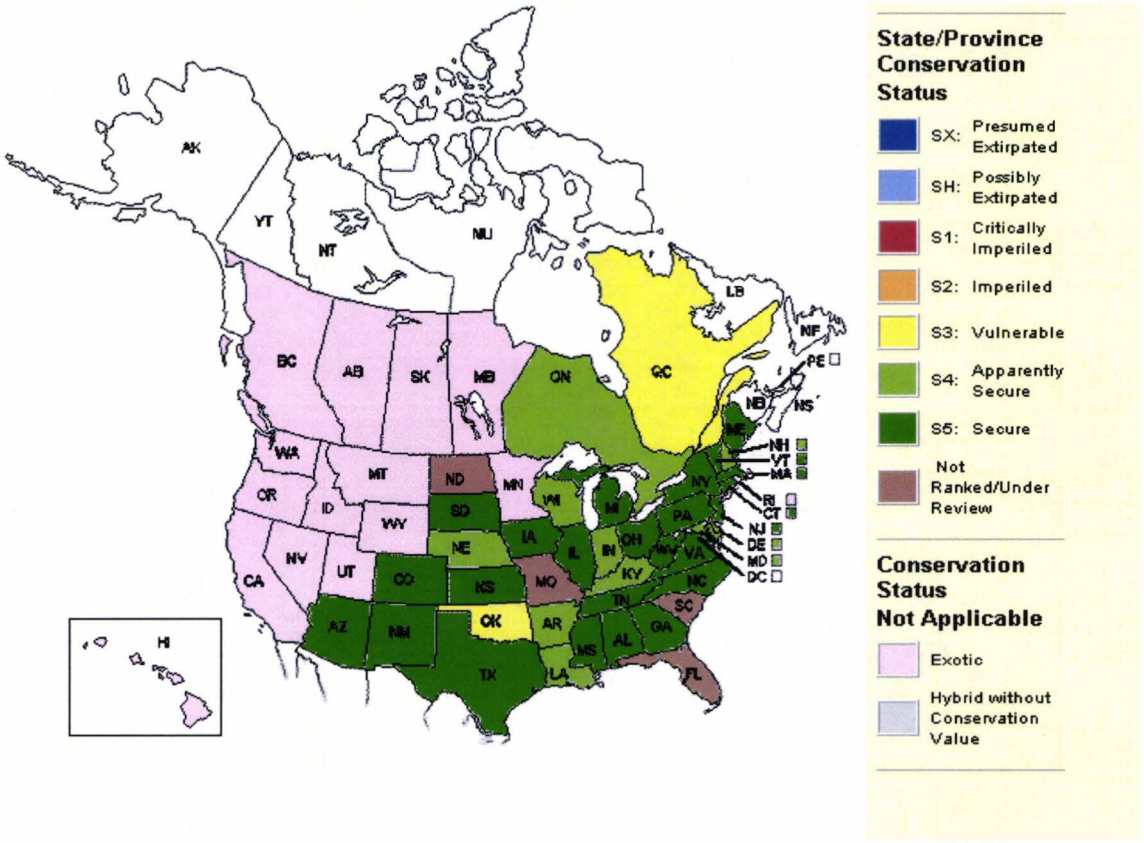


Figure 3. Distribution map of turkey in North America displaying conservation status by state (Natureserve 2005).

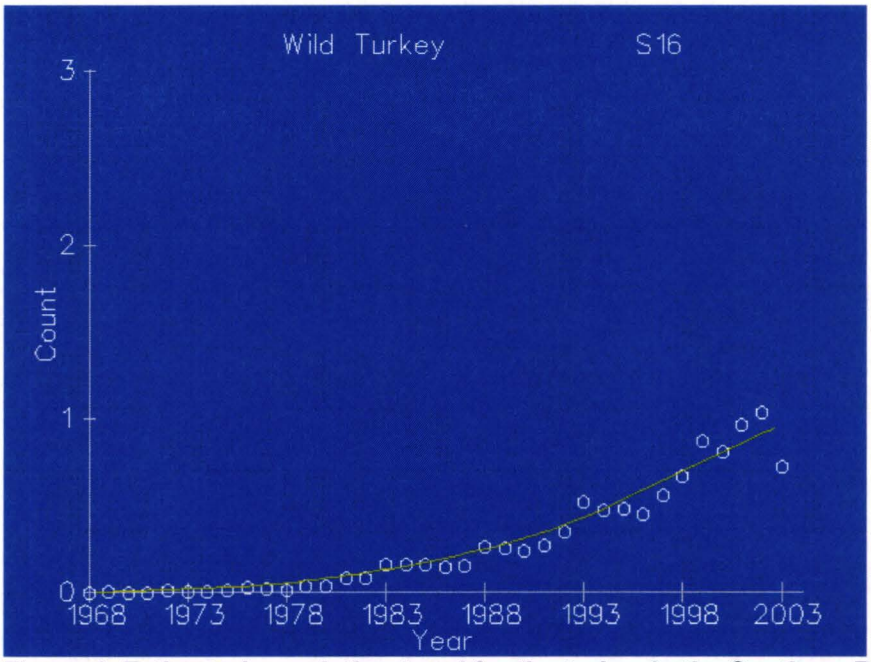


Figure 4. Estimated population trend for the turkey in the Southern Rockies/Colorado Plateau region from 1966-2003 (Sauer et al. 2004).

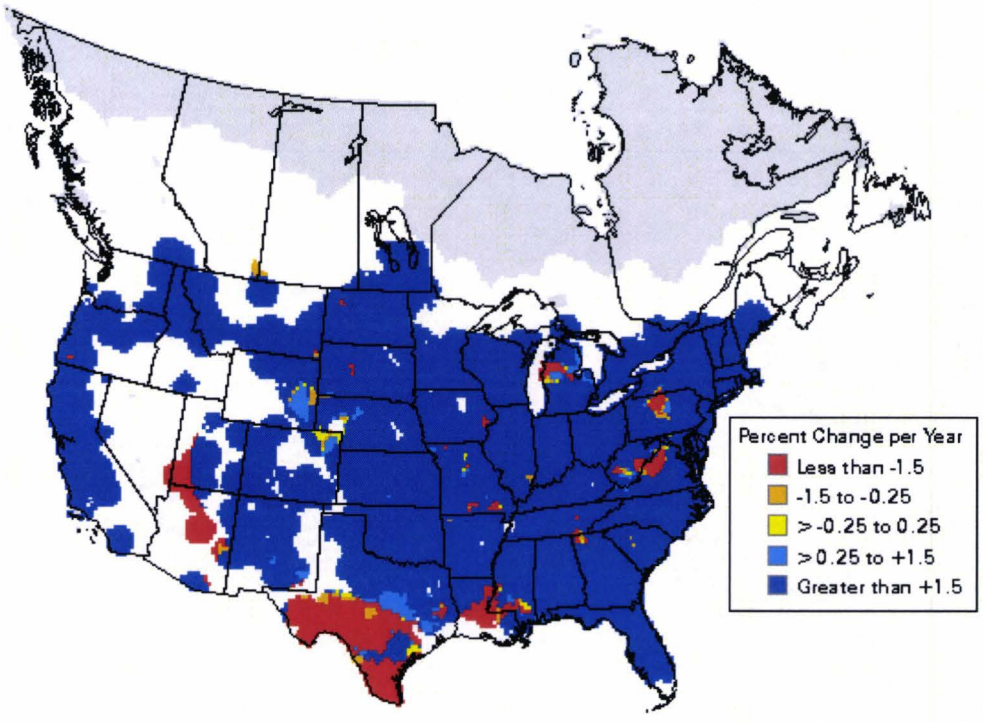


Figure 5. Breeding Bird Survey population trend map for the turkey in Arizona from 1966-2003 (Sauer et al. 2004).

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The turkey was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). The Arizona Partners in Flight did not list a statewide population objective for turkeys. The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort also did not identify the turkey as a species of concern in this region.

Apache-Sitgreaves National Forest

The turkey is considered a fairly common, permanent resident of the Apache-Sitgreaves NF (USDA Forest Service 1996), as well as the adjacent Gila NF (USDA Forest Service 1997). Recent MIS monitoring efforts in the Black Mesa Ranger District (unpublished data) conducted from 2001-2005 support the status of the turkey as a relatively common species in the Forest. Turkeys (n=2, 0, 3, 13, 7) were seen in the high burn area of the Rodeo-Chediski fire and where pine-oak was present.

The Arizona Game and Fish Department surveyed a portion (e.g. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Of these, 65 sectors occurred on ASNF lands. Merriam's turkeys were detected, from 1993 to 2000 in 36 of these sectors, well distributed across the Forest (Figure 7). A clear association with forested (ponderosa pine/mixed-conifer/spruce-fir/aspen) lands is not obvious because of the scale of data associated with the

detections. However, at least 28 of these detections appear to be in areas dominated by these forest types. The remaining eight sites are generally located in pinyon-juniper or oak woodland, montane grassland, or riparian areas that could easily have been specifically associated with small areas of forested habitats.

Arizona Game and Fish Department manages the state's wild turkey population through annual hunting permits that includes a spring gobbler-only hunt and a fall either-sex hunt. Based on legal hunting harvest, as well as survey data, wild turkey populations in Arizona have been in a general decline since 1969 (Arizona Game and Fish 2004). Current estimates number the population between 15,000 and 20,000 birds depending on conditions. Fall hunting is now by permit only, and in the spring, the number of gobblers taken is equal to or greater than the fall harvest. Harvest levels from hunt units on the Apache-Sitgreaves NF indicate a relatively stable harvest trend over the last decade (Figure 6). Relative abundance data for summer and winter ranges is based on Arizona Game and Fish survey information and is displayed in Figures 8 and 9. Again these maps indicate a well distributed turkey population on the Forest.

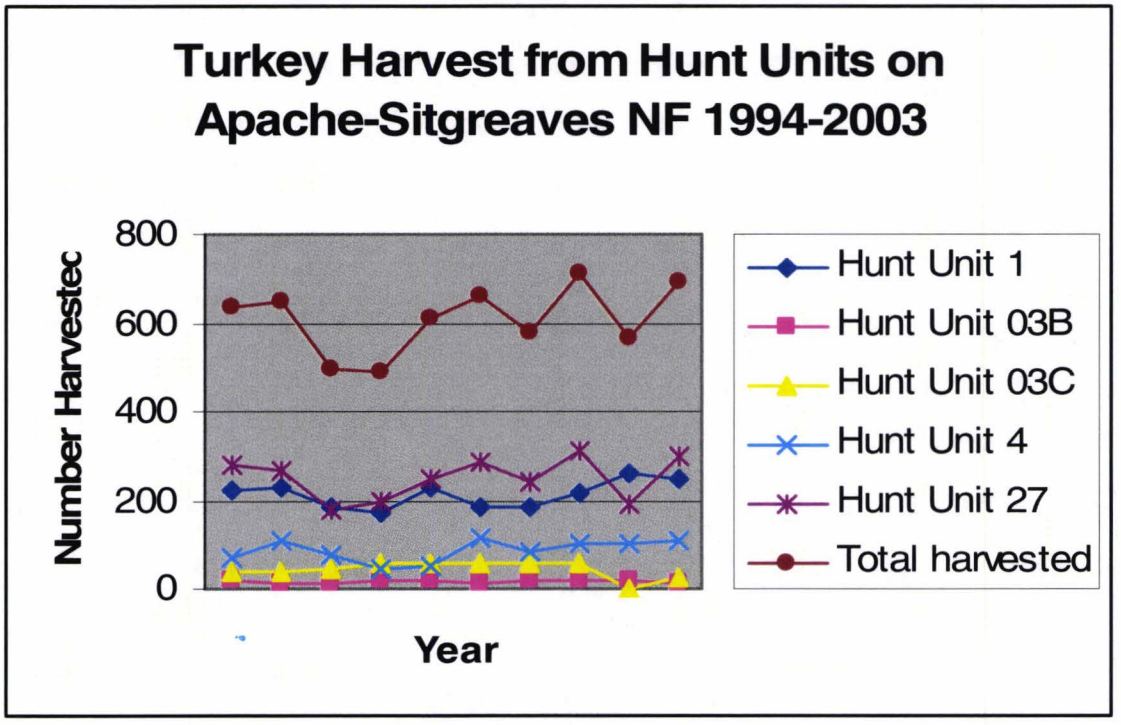


Figure 6. Turkey harvest data from Arizona Game and Fish 2004.

Taking into account the continuing occurrence of the turkey across the Forest in suitable habitat, the abundance and wide distribution of suitable habitats across the Forest, stable habitat trends for late succession habitat in the Forest, and the presence of a harvestable surplus in the turkey population, it appears that the Forest supports a well distributed reproducing population of this species. **Currently, turkey populations in the Apache-Sitgreaves National Forest are considered to be stable, and likely near potential.**

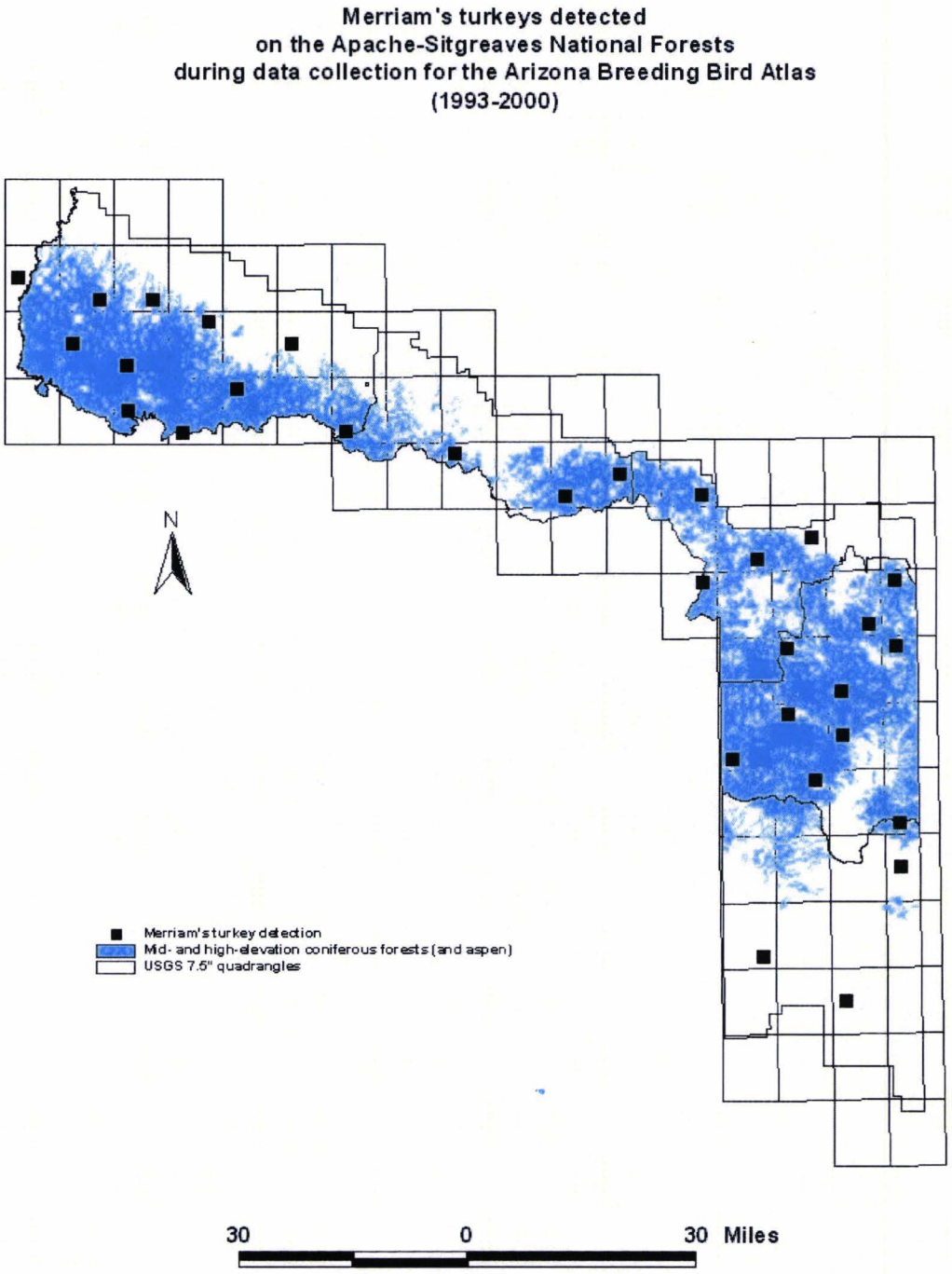


Figure 7. Distribution of turkey detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of mid and high elevation coniferous forests.

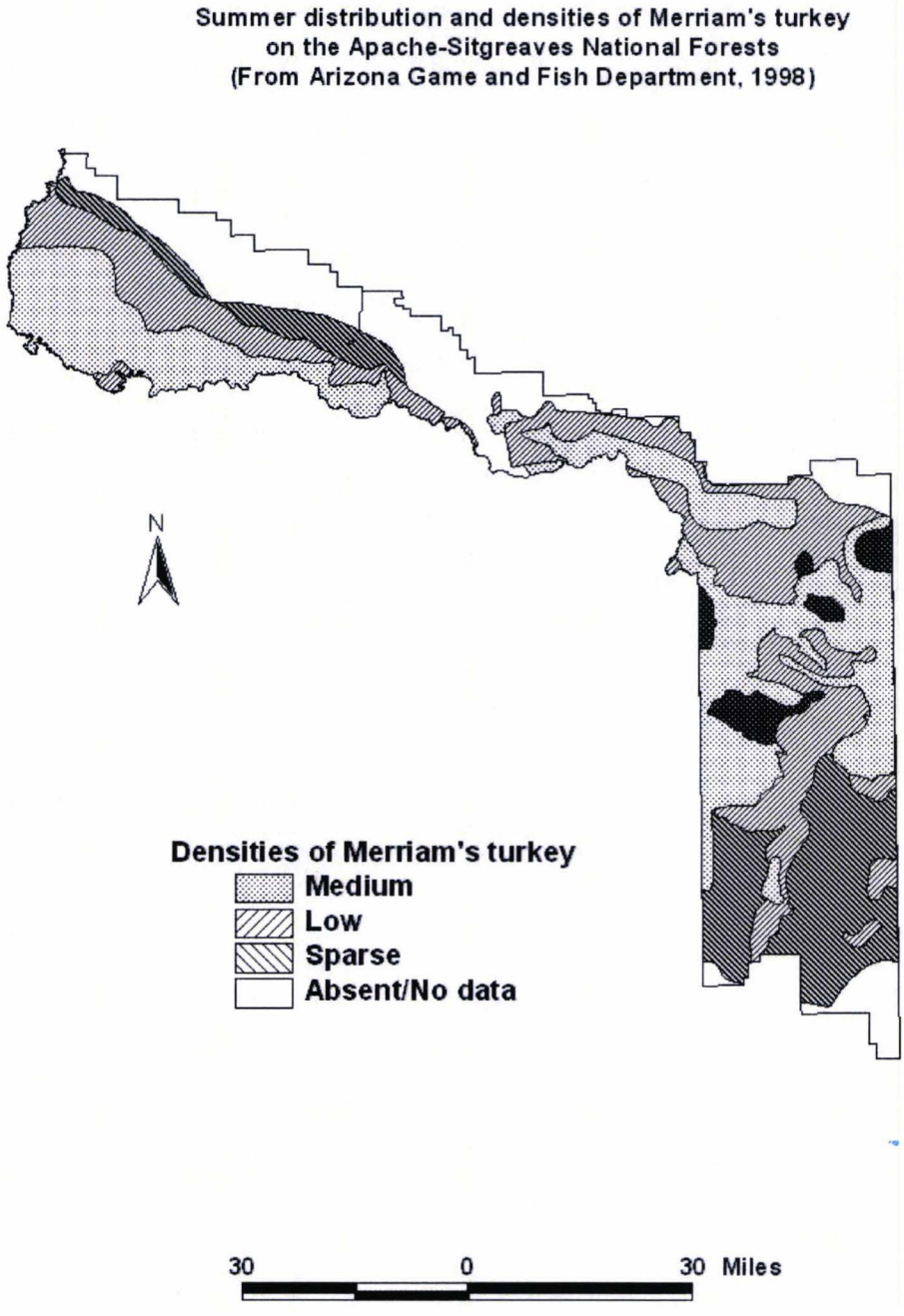


Figure 8. Relative abundance data for turkeys in summer in Apache-Sitgreaves NF.

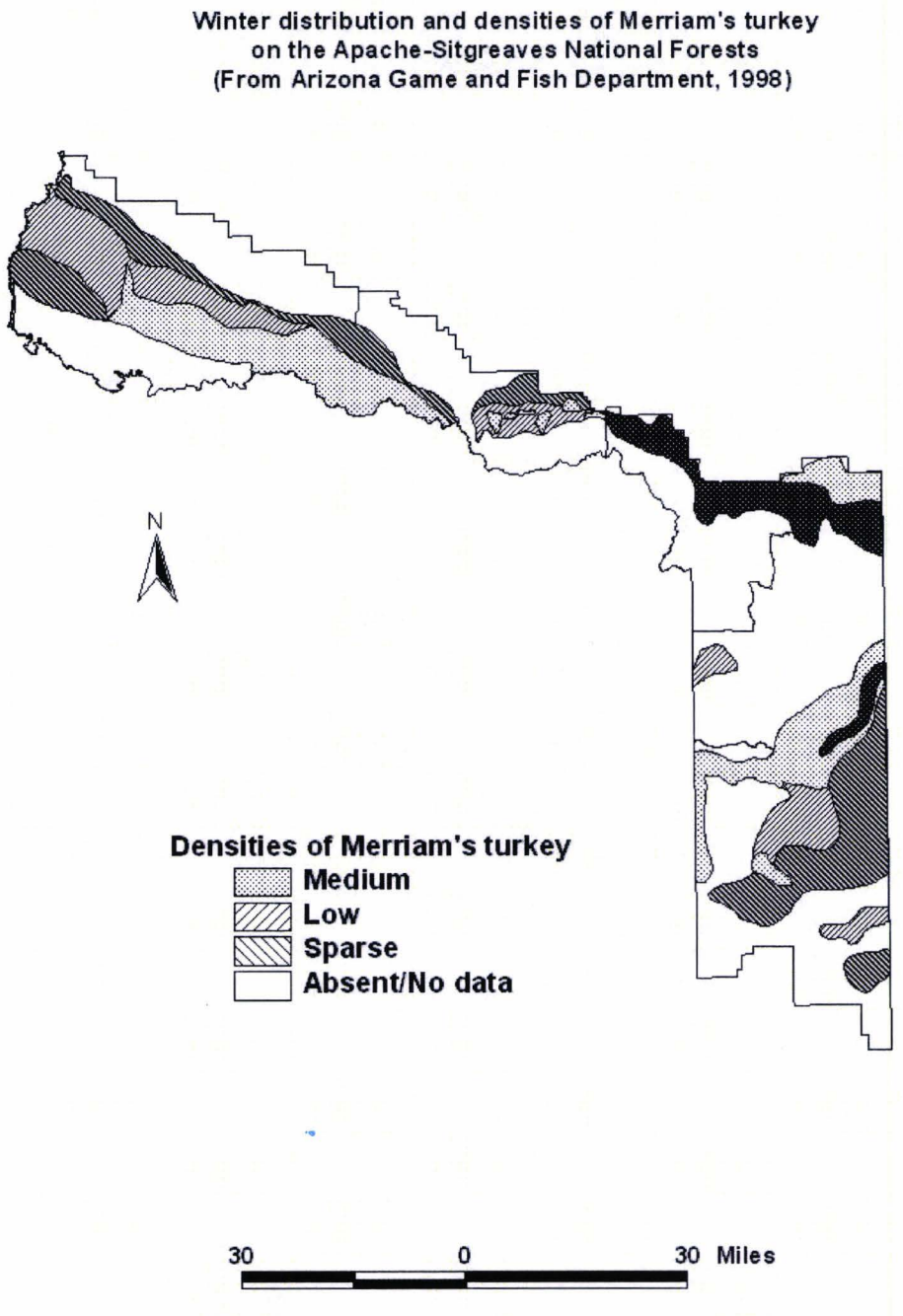


Figure 9. Relative abundance data for turkeys in winter on Apache-Sitgreaves NF.

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Spotted owl (*Strix occidentalis lucida*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves NF, the spotted owl is a management indicator species for late succession. The Mexican spotted owl (Strix occidentalis lucida) is one of three subspecies of spotted owl recognized by the American Ornithologists' Union (AOU). The other two subspecies are the northern (S. o. caurina) and the California spotted owl (S. o. occidentalis). The Mexican spotted owl is geographically isolated from both the northern and California subspecies (U.S. Fish and Wildlife Service, 2002). The Mexican spotted owl occurs from southern Utah and Colorado south through the mountains of Arizona, New Mexico, and west into the mountains of central Mexico (see Figure 1). The Mexican spotted owl is distributed patchily throughout its range reflecting the naturally fragmented forest and canyon habitat of the southwest.

Mexican spotted owls nest, roost, forage and disperse in a diverse array of biotic communities. Mixed-conifer forests are commonly used throughout most of the range, which may include Douglas-fir and/or white fir, with codominant species including southwestern white pine, limber pine, and ponderosa pine. Ponderosa pine-Gambel oak forests in northern Arizona and Madrean pine-oak forests in the Sky Islands of southern Arizona are also commonly used for nesting and roosting.

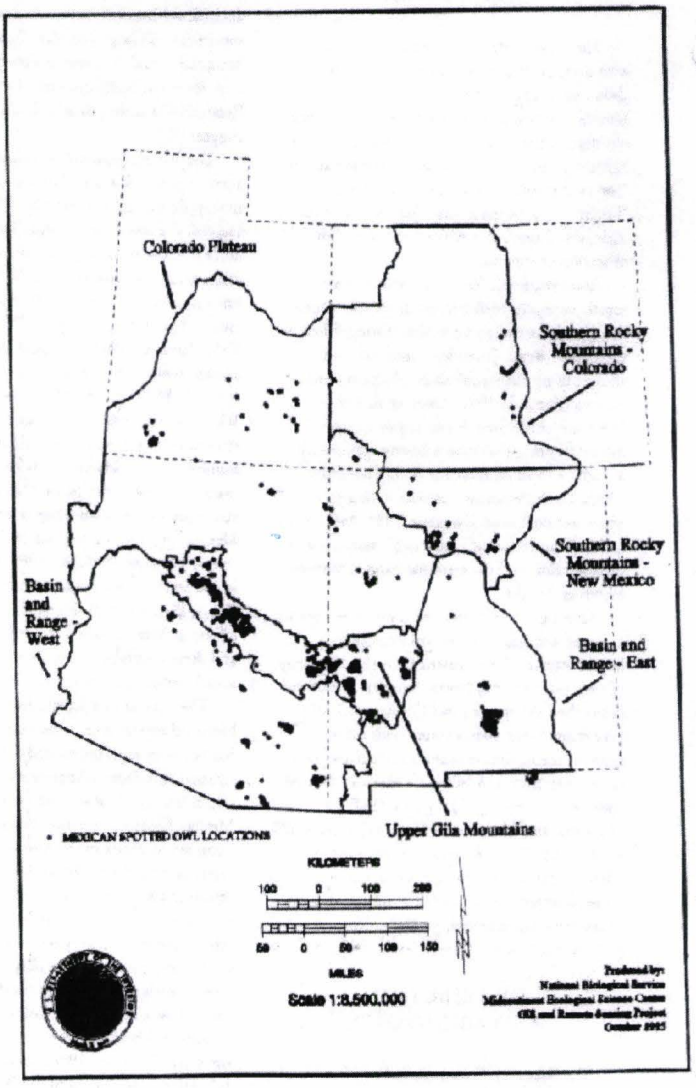

Figure 1. Distribution of Mexican spotted owls in the U. S. based on planned surveys and incidental observations recorded from 1990-1993. (USDI Fish and Wildlife Service, 1995).

In the northern part of the range, including southern Utah, southern Colorado, and far northern Arizona and New Mexico, owls reside primarily in rocky canyons. Along the Mollogon Rim, where habitat is less restricted, spotted owls are found in mixed conifer forests, Ponderosa pine - Gambel oak forests, rocky canyons, and associated riparian forests (U.S. Fish and Wildlife Service, 1995). Little data is available about the patterns of habitat use by foraging owls. Ganey and Balda (1994) did

find that spotted owls use a wider variety of forest for foraging than for roosting.

Mexican spotted owls nest and roost primarily in closed-canopy forests or rocky canyons. In the northern portion of their range, most nests are in caves or on cliff ledges in steep walled canyons. Elsewhere the majority of nests are in trees containing debris platforms, stick nests built by other birds or squirrels, or in tree cavities. Spotted owls do not build their own nests.

The Recovery Plan for the Mexican Spotted owl indicates that home ranges vary from 645 to 3,831 acres. In the Upper Gila Recovery Unit, in which the Apache-Sitgreaves National Forests are located, the home ranges were between 941-3,831 acres (USDI Fish and Wildlife Service, 1995) in radio telemetry data collected from fives studies.

Mexican spotted owls eat a variety of animals throughout their range but usually take small and medium mammals as prey. Specific prey groups include: woodrats, mice, voles, rabbits, squirrels, pocket gophers, shrew, squirrels, chipmunks, bats, birds, reptiles, and arthropods. Ward and Block (1995) summarized some prey data from the Apache-Sitgreaves. They found peromyscid mice comprised 22.7% of prey items in the 1992-1993 diets on the Mogollon Rim. The frequencies of other prey items were as follows: woodrats 21.7%, arthropods 16.7%, other medium mammals 13%, and voles 8.8% (from unpublished USDA Forest Service data). In the White Mountains voles comprised 37.6% of prey items. The frequencies of other prey items taken in the White Mountains were as follows: woodrats 17.8%, peromyscid mice 20.4%, pocket gophers 5.7% and other medium mammals 5.7% (Ganey, 1992).

Management Activities or Natural Events That May Affect Habitat

Negative: Timber harvest that opens forest canopies and converts mature and late-succession stands to earlier succession; large-scale wildfires; large scale insect epidemics.

Positive: Protection of large, mature to old-growth forest tracts; maintaining large trees for future down logs and snags; fire suppression.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (USDA Forest Serviced 1987a), specific "Standards and Guidelines" that apply to snags and mature forests in Management Area 1 (p. 122) include:

- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement p. 122-2).

- Minimum criteria used to determine old growth include 1 snag/acre in ponderosa pine, 2.5 snags/acre in mixed-conifer, and 3 to 4 snags/acre in spruce-fir. No minimum criteria are identified for identifying aspen old growth (p. 122-2).

- Implementing the Forest snag policy, providing at least 55% of a diversity unit with at least 180 snags per 100 acres. In high-priority areas, including both edge habitats adjacent to meadows or water, manage for an average of 280 snags per 100 acres. Only ponderosa pine/mixed-conifer species will be counted toward meeting minimum snag requirements (p. 122-3).

Standards and Guidelines were added to the Forest Plan for Mexican spotted owl habitat and old growth designations following the Final Rule to list the Mexican Spotted Owl as a Threatened species (USDI Fish and Wildlife Service, 1993) in 1993 and the Recovery Plan for the Mexican Spotted Owl (USDI Fish and Wildlife Service, 1995). The Standards provide three levels of habitat management – protected, restricted, and other forest and woodland types. These levels are designed to achieve a diversity of habitat conditions across the landscape and include the following:

- Protected areas include delineated protected activity centers of 600 acres; mixed conifer and pine-oak forests with slopes greater than 40% where timber harvest has not last 20 year; and reserved lands which include wilderness, research natural areas, wild and scenic rivers and congressionally recognized wilderness study areas.

- Restricted areas include all mixed conifer, pine-oak and riparian forests outside of protected areas.

- Other forest and woodland types (no specific guidelines)

The amended Forest Plan also includes specific management objectives related to snags and larger trees for northern goshawks and Mexican spotted owls (pp. 70 to 70-16). This direction was implemented to bring forest plans into compliance with the Mexican Spotted Owl Recovery Plan (USFWS 1995) and to "safeguard the viability of Mexican spotted owl" (USDA Forest Service 1996), but also addressed the habitats for which spotted owls were selected to represent as a management indicator species. Specifically, these guidelines direct the management of vegetation to:

- Leave at least 2 snags/acre in ponderosa pine forests
- Leave at least 3 snags/acre in mixed-conifer forests
- Leave at least 3 snags/acre in spruce-fir forests

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was late succession. Currently on the Forest there are 135 PACs and the Record of Decision (1996) provides for 600 acres of protection around each activity center. Therefore approximately 81,000 acres of occupied habitat on the forest are designated as protected habitat where certain management activities are restricted by the Forest Plan as amended and Mexican spotted owl recovery plan (UDSI Fish and Wildlife Service 1995). All habitat on slopes greater than 40% are also protected from harvest of trees over 9.0'dbh and where timber harvest has not occurred in the past 20 years. Restricted habitat includes all mixed-conifer, pine-oak, and riparian forests outside of protected areas. Figure 2 displays the projected number of restricted acres using data from a pilot study by Ganey and Benoit (2002) using the Terrestrial Ecosystem Survey to identify potential habitat for Mexican spotted owls. This study identified 490,295 acres of potential restricted Mexican spotted owl habitat acres.

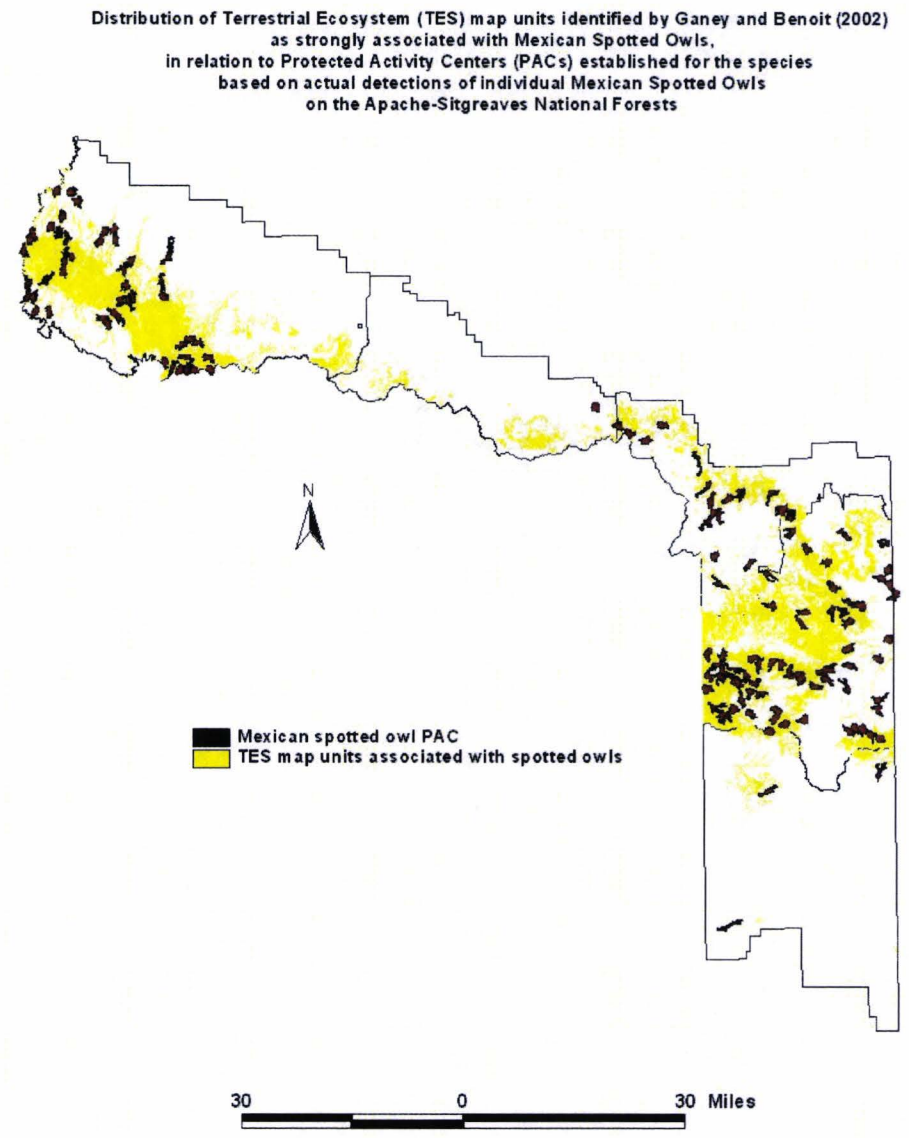

Figure 2. Potential habitat for Mexican spotted owls on the Apache-Sitgreaves National Forests using terrestrial ecosystem survey data per Ganey and Benoit 2002.

The "Habitat Quality Index Model" (version 18) (HQI), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for spotted owls. Based on Forest Inventory and Analysis (FIA) date collected in 1996, there are approximately 649,069 acres of suitable and potential Mexican spotted owl foraging habitat and 68,133 acres of suitable and potential cover habitat. The overall habitat quality rating is 0.3 (i.e. the habitat will support 30% of maximum potential populations). This is less than the 40% recommended in the Forest Plan to support a viable population of Mexican spotted owls.

Since the FIA data was collected, both timber harvest and wildfires have affected mixed conifer and ponderosa pine forests. Total annual timber harvest history in the Forest is shown in Figure 3. However, not all timber harvest adversely affects habitat for the spotted owl. Records of

harvest levels for the forest (Beal 2005) indicate that there have been 1,890 acres of timber harvests that removed large-diameter trees (seed cuts, clearcuts, and overstory removals) since 1996 for an average of about 371 acres per year. At the same time, trees are growing in the rest of the Forest and habitat conditions there are gradually improving. Trees are becoming larger in diameter, taller, and more dense (USDA Forest Service 2003). Because of this, it is not likely that the habitat capability for spotted owls has been reduced since 1996 due to timber harvest. See Appendix A for more discussion of forest growth.

Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

Figure 3. Annual timber treatments in the Apache-Sitgreaves NF (1985-2006).

Wildfires have also affected mature and late-succession forests, especially the Rodeo-Chediski fire. Since 1985, acreage burned in the Apache-Sitgreaves National Forests from wildfires totaled less than 2,000 acres per year for 11 years out of 18 (Figure 4). From 1985 to 1996, wildfires impacted about 5,356 acres each year in the Forests. From 1997 to 2001 (after FIA data collection), an average of 1,477 acres each year have been impacted to some extent by wildfires in the Forests. Information is not available summarizing cover types impacted by these fires, or the acreage actually impacted by "high-intensity" conflagrations. However, it is likely that high-intensity fires impacted only a small percentage of these acres (J. Thompson, pers. comm.). Likewise, not all of the acres impacted by high-intensity fires were in habitats important for spotted owls. Given the wide distribution of spotted owls across the Forests (Figure 2), the continued recurrence of wildfires, as observed from 1985 to 2001, is not likely to significantly reduce or fragment the distribution of spotted owls in the Forests. In addition, this type of fire regime is also not likely to reduce the overall habitat capability for spotted owls to levels where the Forests are no longer able to provide habitat to sustain a reproducing population of the species.

Catastrophic fires, such at the Rodeo-Chediski wildfires of 2002, may cause landscape-wide modifications to the habitat capability of the Forests for spotted owls. There were 59,988 acres of pre-fire mixed conifer and pine-oak habitat on NFS lands within the Rodeo-Chediski fire perimeter (USDA Forest Service 2003b). About 12,096 acres were located within PACs. Another 46,462 acres were considered "restricted habitat" or "protected habitat" as defined in the recovery plan for the Mexican spotted owl (USDI Fish and Wildlife Service 1995). Portions of these habitats burned at moderate to high severity leaving about 20,031 acres outside of PACs that currently meet the specifications for restricted or protected habitat. There were twenty protected activity centers (PACs) within the burn perimeter on NFS lands. The Rodeo-Chediski fire impacted eleven PACs on the Apache-Sitgreaves National Forest and nine on the Tonto

National Forest below the Mogollon Rim. Post-fire monitoring of these PACs in 2003 revealed owls in eight of the 20 PACs. No new PACs were found. The effects of the fire on the owl population on the Apache-Sitgreaves NF will probably not be known for several years.

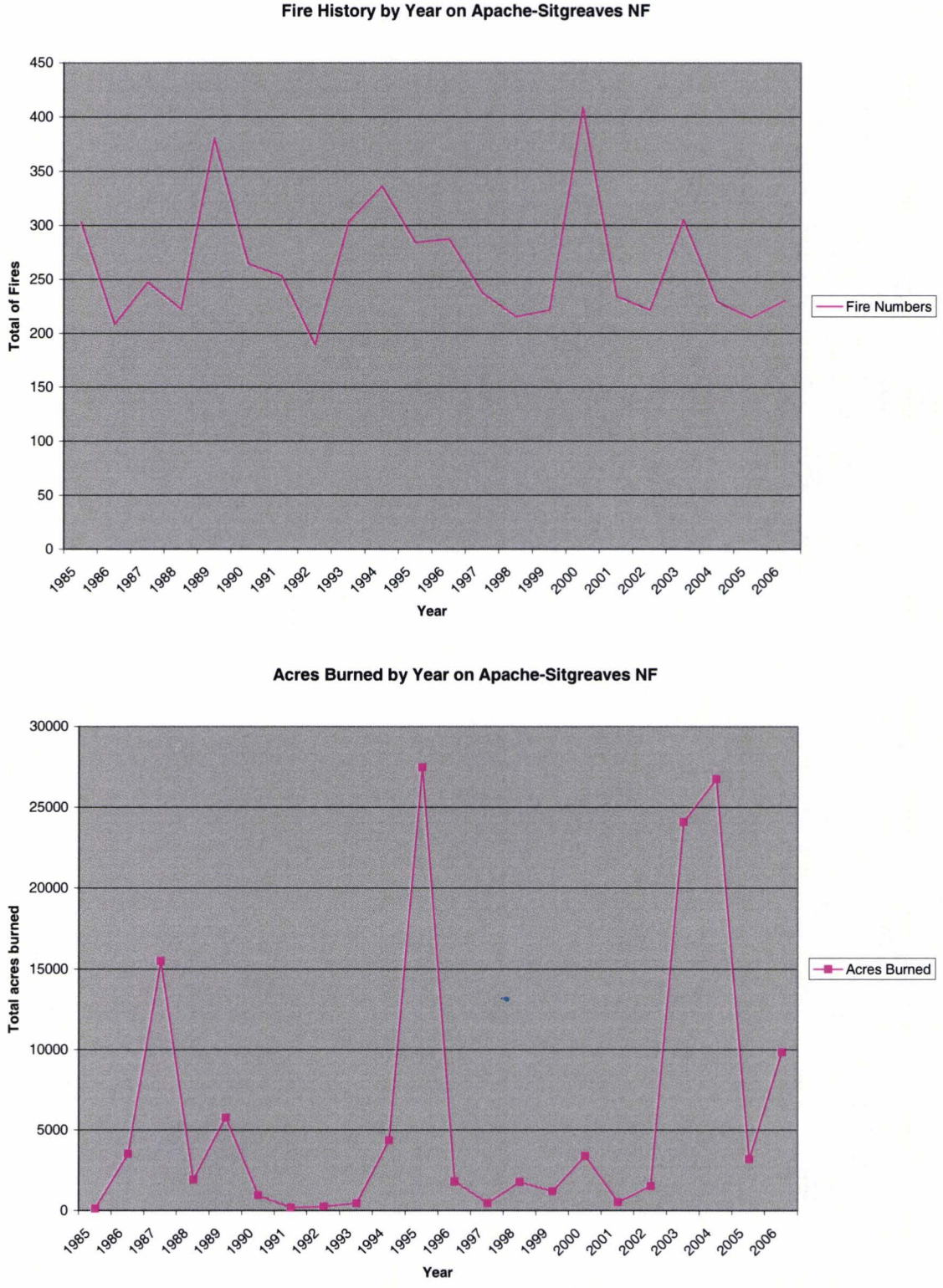

Figure 4. Summary of fires and acres burned annually by wildfire and prescribed burn in the Apache-Sitgreaves NF (1985-2006). Actual figure in 2002 was 173,000 acres due to the Rodeo-Chediski fire.

Another consideration in assessing Forestwide habitat trend for the spotted owl is the abundance of dead and down wood. Snags and down logs are considered key habitat components for spotted owls use snags for both nesting and prey species habitat (USDI Fish and Wildlife 1995). The 1996 FIA for the Apache-Sitgreaves NF indicated that there were about 3.5 snags per acre that are 11 inches in diameter or greater at the time of the inventory and 1.4 snags per acre that are 17 inches or greater. About 40% of these large snags were found in ponderosa pine. However, these snags probably were not evenly distributed across the landscape. The FIA data also indicated that there were about 1.5 million tons of down logs >5" diameter, averaging about 0.86 tons/acre. These levels of snags and down wood are less than ideal for Mexican spotted owls. However, one researcher (Ganey 1999) believes that levels of dead and down wood listed in revised Forest Plan (USDA Forest Service 1996b) may be unattainable and are probably above levels occurring naturally in the past.

Snags and down logs continue to be created by insects and disease in the Forest. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 4. Infestations vary widely from year to year but continue to be present in the Forest, creating pockets or larger areas of new snags.

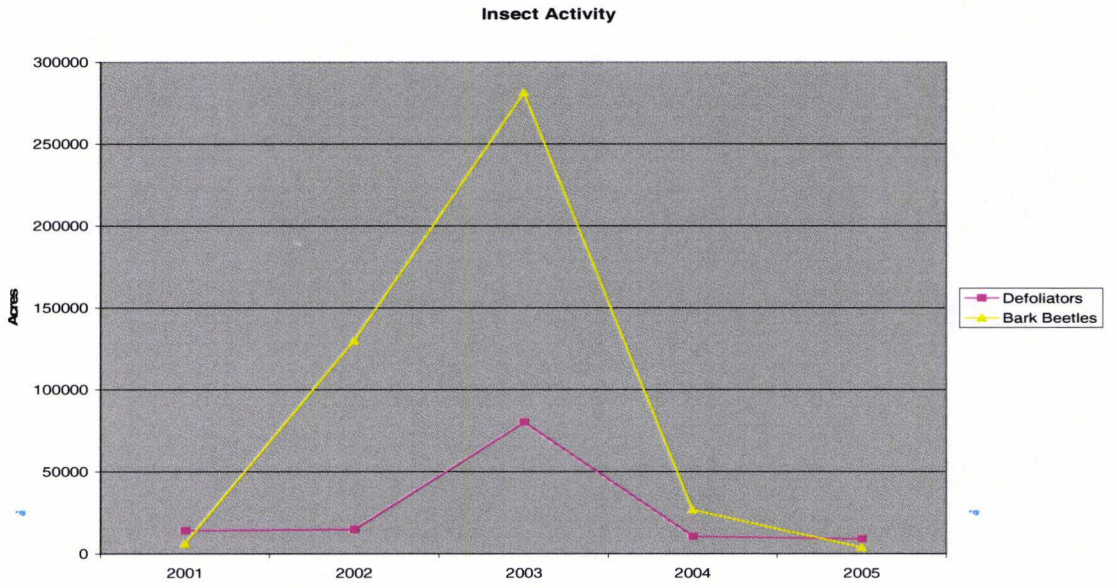

Figure 5. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2005).

Fire also continues to create snags in the Forest. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 3. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771.

The Rodeo-Chediski fire created large numbers of snags in the burned area. Prior to the fire, large snags (≥18" DBH) numbered about 0.4 snags per acre in ponderosa pine habitats and about 1.2 snags per acre in mixed-conifer habitats (USDA Forest Service 2003b). No aspen

stands were burned in the fire. After the fire, large snags averaged 7.6 snags per acre across the burned area. There are still pockets of low-severity burned and unburned stands with low snag numbers. Snag densities in these areas are increasing due to increased insect activity (USDA Forest Service 2003b). Snags are expected to fall over in the next 2-20 years depending on tree species and size. No additional recruitment of snags is expected for at least 75 years in areas of moderate and high-severity burn.

The ROD and EIS for the Rodeo-Chediski Fire Salvage project authorized salvage of fire-killed trees on about 34,000 acres of the burned area. Trees to be removed are greater than 12" DBH. Two snags per acre were prescribed to be left in most salvage units and five snags per acre in the remaining units. This project was expected to result in an average of 6.3-6.8 large snags remaining across the burned landscape after treatment (USDA Forest Service 2003b).

Based on the information, available **habitat quality for the spotted owl is low with a slight downward trend** due to recent wildfires. **Habitat on unburned portions of the Forests is likely improving** due to protection of existing and potential old growth areas, decreasing harvest levels, and high net annual growth rate. However, actual improvements in the quality of late succession management areas will take many decades. **The upward trend in habitat will be slow.** The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

POPULATION TREND

Mexican spotted owls are distributed from southern Utah and central Colorado south through the mountainous regions of Arizona, New Mexico, western Texas (Guadalupe Mountains), northern Sonora, Chihuahua, and Nuevo Leon south to Michoacan and Puebla (USFWS 1994, 1995)(see Figure 6). Mexican occurrences documented during 1990-1993 were in the Sierra Madre Occidental, Sierra Madre Oriental, and Eje Neovolcanico, south to Aguascalientes; the Mexican portion of the range has not been thoroughly surveyed (USFWS 1995).

The species has been listed as "threatened" under the Endangered Species Act since 1993. Many populations in Arizona and New Mexico occur in relatively isolated mountain ranges, sometimes separated by large expanses of non-forested habitats; little is known of the populations in many of these mountain ranges. Some ranges may include too little habitat to support spotted owl populations indefinitely without periodic immigration from neighboring ranges (Ganey, in Thomas et al. 1990). Abundance (density) is greatest in the central portion of the range with a little more than half of the U.S. population occurring in the Upper Gila Mountains Recovery Unit (USFWS 1995). Current distribution is nearly the same as the historical distribution, though historical occurrences in southern Mexico, in major riparian corridors in Arizona and New Mexico, and in several other specific localities have not been reconfirmed by recent surveys (USFWS 1995). Total population size is not reliably known, but the minimum number in the early 1990s was about 800-1500 individuals (USFWS 1995).

The Global Heritage Status Rank (NatureServe 2005) for the Mexican spotted owl is G3 and N3. This means the species is considered vulnerable to extinction or elimination globally and nationally (USA). Typically between 3,000-10,000 individuals are thought to exist. The Arizona Heritage Status Rank is S3S4. S3 is defined, as the species is considered vulnerable to extirpation, typically between 3,000 and 10,000 individuals. S4 is defined as the species is

apparently secure-uncommon but not rare, usually more than 10,000 individuals. The reasons for the global heritage status rank are listed as, "occurs in the southwestern and northern Mexico; a fairly large number of occurrences, but a relatively few are of high quality, and the population trend is probably downward because of past and continuing loss and/or fragmentation of habitat, especially even-age timber management; threatened in some areas by the potential for catastrophic fire." The global abundance comments states "the total population size is not reliably known, but the minimum number in the early 1990s was about 800-1,500 individuals. The Arizona-New Mexico population has been estimated at around 2,000 individuals" (NatureServe 2005) from USFWS 2000 information.

A demography study that occurred on two study sites in the Upper Gila Recovery Unit between 1991 and 1998 indicated a declining trend in Mexican spotted owl populations (Seamans et al. 1999). The study concluded that two possible reasons for the population declines were habitat quality and regional trends in climate. Seamens et al. (2002) concluded that unpredictable changes in the environment, driven by climatic factors, likely play a large role in population dynamics and are probably responsible for part of the decline.

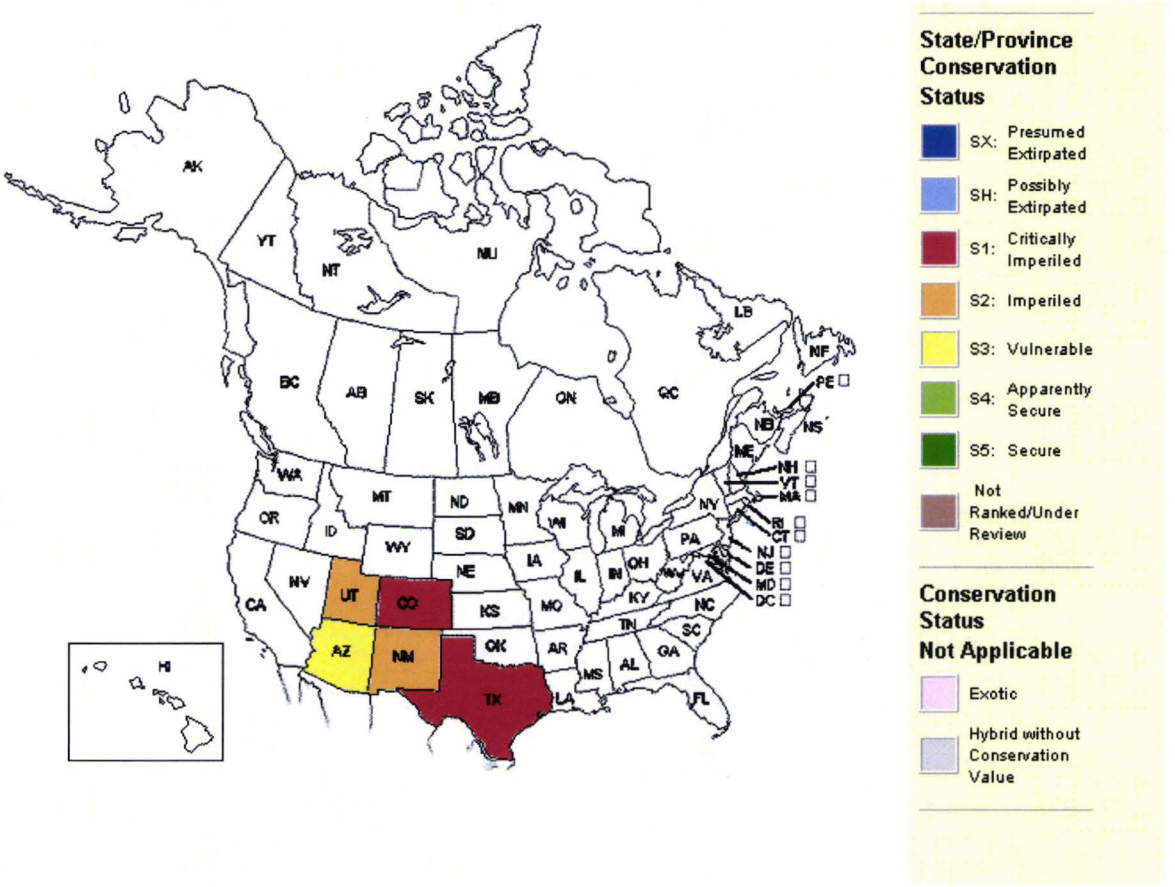

Figure 6. Map of distribution and conservation status of the Mexican spotted owl in the United States (NatureServe 2005).

Arizona

The spotted owl is considered a rare permanent resident of the Apache-Sitgreaves NF and an uncommon resident in the adjacent Gila NF in New Mexico (USDA Forest Service 1996; USDA Forest Service 1997). Arizona-New Mexico population has been estimated at around 2000 individuals (USFWS 2000, 1995).

Apache-Sitgreaves National Forest

Surveys for Mexican spotted owls on the Apache-Sitgreaves National Forests began in 1984. By 1987, thirteen core areas were designated on the Forest to represent territories. Today there are 135 Protected Activities Centers (PACs) established to represent territories (see Figure 7). The Interim Directive No. 2 (1990) established the standards and guidelines to inventory and monitor for spotted owls. The survey and monitoring protocols were not designed to estimate population trends. Areas with management activities planned or to be implemented are surveyed, but areas outside of management activities are not usually surveyed. Likewise, the monitoring effort is highly variable between Protected Activities Centers (PAC). Those PACs visited and the numbers of visits to determine occupancy and reproductive status are not consistent from year to year. However, occupancy rates have varied from a high of 100% of four PACs monitored in 1984 to a low of 14% of seven PACs monitored in 1985. The average occupancy rate since monitoring began in 1984 has been 55% over 20 years. Over the last 10 years the occupancy rate has been about 47% of monitored PACs. Occupied status was determined based on the detection of a pair of spotted owls during breeding season. Reproduction was not confirmed at many of these locations.

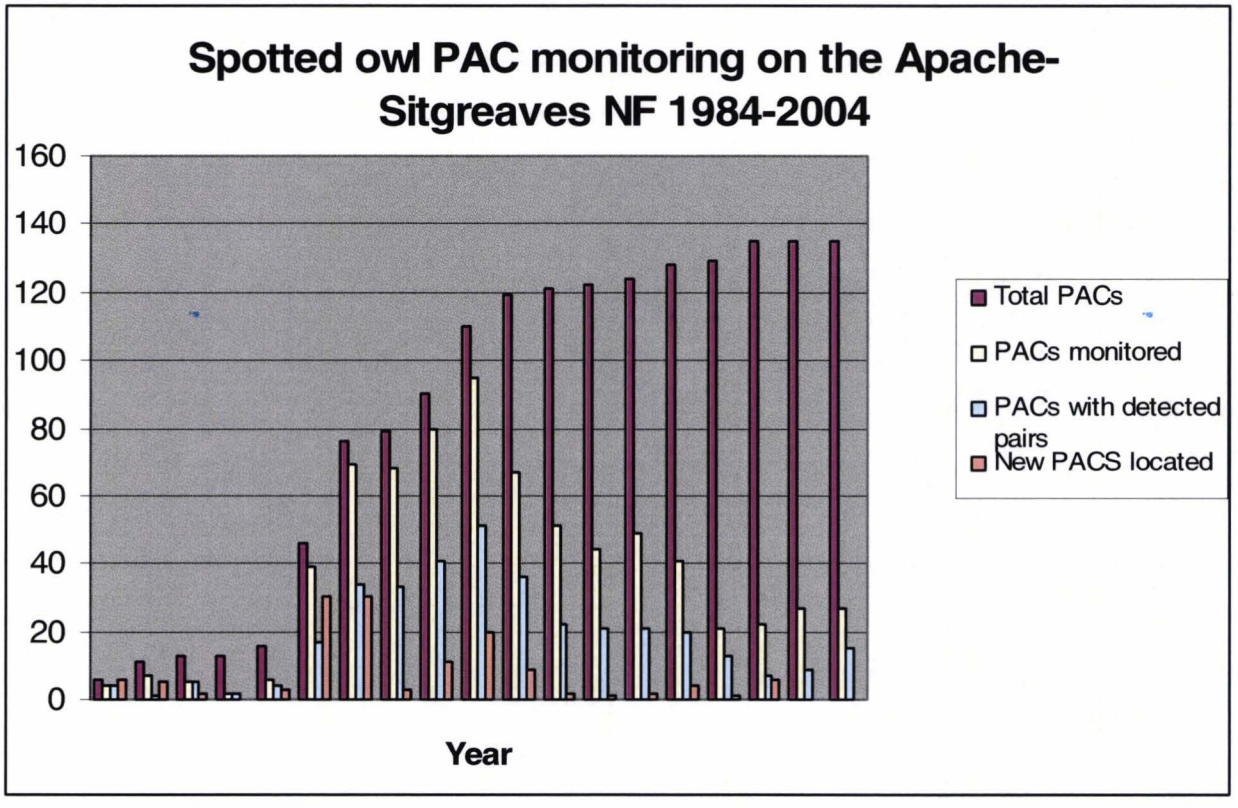

Figure 7. Results of monitoring of Mexican spotted owl PACs on the Apache-Sitgreaves National Forests 1984-2004.

Available information does indicate that spotted owls are fairly well distributed in forested habitats on the Apache-Sitgreaves National Forests. Occupancy rates appear relatively consistent over the last 20 years. Habitat capability for the species appears to be marginal (HQI = 0.3) for the species. **Currently, spotted populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely lower than potential.** The population level effects of the Rodeo-Chediski fire will not be known for several years.

Taking into account the continuing occurrence of spotted owls across the Forest in suitable habitats and protection of areas known to be used by reproducing owls (i.e. PACs) **it appears that the Forest supports a well distributed, reproducing population of this species.** Continued application of Forest Service direction to manage spotted owl habitats at an ecosystem level is likely to prevent further loss of habitat capability and maintain habitat that will continue to support a well distributed population of reproducing owls. However stochastic environmental events such as wildfire may continue to pose a risk to local populations on the Forest especially over the next decade (USDA Forest Service 2004b).

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Mule deer (*Odocoileus hemionus*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the mule deer is an indicator species for early-succession habitat (USDA 1987a, p.134). Mule deer was selected as a MIS for the spruce fir, mixed conifer, ponderosa pine and pinyon juniper habitat components. Mule deer are extremely adaptable and can be found in all major climatic and vegetational zones of the Western United States except the arctic, tropics and extreme deserts (Boyd and Cooperrider 1986). The mule deer is the most abundant and widely distributed deer in Arizona (see Figure 1) (Hoffmeister 1986, Arizona Game and Fish 2004). Mule deer are not limited to any one type of terrain, being found from sparse, low deserts to high forested mountains. Generally they prefer the more rugged country.

Deer feed on grasses and forbs in the spring and summer; however, they are primarily browsers. They eat such items as twigs, bark, buds, leaves, and nuts. Most feeding is done at dawn and dusk, although human activity may cause a shift to more feeding at night. Some important food items for mule deer in Arizona include, oak, juniper, mountain mahogany, ceanothus, pinyon, cliff rose, bitterbrush, Douglas fir, white fire and ponderosa pine (McCulloch 1978, Currie et al. 1977, McCulloch and Smith 1982). Mule deer of the pine forest also feed on aspen, lupine, mistletoe, mushrooms and sagebrush (McCulloch, 1978). Although mule deer are considered "browsers", Severson and Medina (1983) point out that grasses become important in the spring and early summer (for short periods), especially cool season species. Reynolds (1969) indicated that deer need areas of heavy timber (in excess of 160 ft2 of basal area in immature stands) to provide escape and security cover. In Arizona, predation on deer is mainly by coyotes, bobcats, and mountain lions (Arizona Game and Fish 2004).

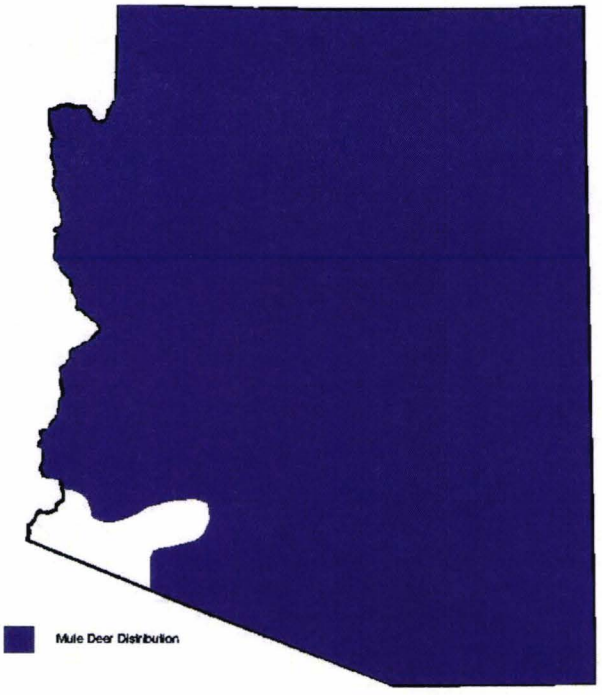


Figure 1. Distribution of mule deer in Arizona (Hoffmeister 1986)

Management Activities or Natural Events That May Affect Habitat

Negative: Urban development, agricultural development (Boyd and Cooperrider 1986), fire suppression. ADD: decline in browse species in early succession stages, and the encroachment of juniper into grasslands and scrub habitats, decreasing the quality of habitat for mule deer.

Positive: Wildfire, prescribed fire, and vegetation management that creates openings in forested habitats.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

In the Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), includes specific "Standards and Guidelines" that are expected to maintain or improve mule deer habitat components in timberlands and woodlands including:

- Use integrated resource management in design of timber harvests to create habitat conditions needed by a variety of wildlife species in a cost effective manner (revised per Amendment 1).
- Where appropriate, apply prescribed fire to improve big game forage.
- Provide big game, non-game, and upland game habitat in aspen.
- Manage to provide a variety of stand sizes, shapes, crown closure, edge contrast, age structure, and interspersion.
- Amendment 1 – Special considerations will be given to critical big game winter ranges in areas where big game winter range has been determined to be a limiting factor in achieving big game objectives. In those areas, no new year-round grazing or new winter grazing by domestic livestock will be allowed unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – New land acquisitions in these critical winter ranges will not be used for domestic livestock grazing unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – Total road densities should average 3.5 miles/square mile or less. Open road densities should average 2.0 miles/square mile or less.

MANAGEMENT AREA 1 - TIMBERLAND

- Provide big game, non-game, and upland game habitat in aspen.
- Thermal cover for elk is a stand of coniferous forest tall and wide enough to allow animal movement and bedding with a high degree of crown closure. Emphasize maintaining thermal cover in known travelways and bedding areas.
- Hiding cover is vegetation and topographical features capable of hiding 90 percent of a standing deer or elk from human view at a distance of 200 feet or less. Emphasize maintaining hiding cover adjacent to dependable water and key openings, along known travelways, and in pine stringers.
- Protect and manage to include hiding and thermal cover and defer logging activities from May 15 to June 30 in known fawning and calving areas. This

restriction may be lifted if on-the-ground inspection indicates that the area is not being used for fawning/calving and other areas adjacent to the sale area are available for wildlife needs.

- In key big game habitat, manage for at least 30 percent of the mixed conifer to meet hiding cover needs. Give priority for cover management in drainage bottoms, heads of drainages, and isolated pockets of mixed conifer. Defer logging in these areas from April 15 to June 30.
- Amendment 1 - On replacement page 124-1 of the FLMP there is a table, which provides specific direction on basal area and growing stock levels, which experience has shown fully meet hiding and thermal cover requirements in even age ponderosa pine and mixed conifer when there are no cover effects from topographic features or other species.

MANAGEMENT AREA 2 - WOODLAND

- Maintain or improve big game habitat. Limit created openings on big game winter range to no wider than 1,200 feet. Leave cover strips at least 500 feet wide between openings; openings are not to exceed 40 acres. Maintain no less than the current level of openings on current antelope ranges. Emphasize openings adjacent to pine stringers.
- Manage areas that are harvested for fuelwood. Emphasize openings on existing and potential big game range. Retain thermal cover and hiding cover on north and east exposures. Manage fuelwood sales to break up large areas of single-age classes. Leave cavity excavated trees, shrubs, and oak in openings created for wildlife.
- Retain ponderosa pine stringers as inclusions.
- Areas needing additional forage for elk are given first priority in scheduling firewood/wildlife habitat treatments. Treatments are usually done in acres remote from major disturbance.
- Mange for hiding cover and thermal cover in known fawning and calving areas.
- Defer firewood activities from May 15 to June 30 in known fawning and calving areas.
- Manage for at least 20 percent of each diversity unit in thermal and hiding cover. Emphasize cover management in travelways, bedding areas, reproductive areas, and adjacent to key openings. Cover is managed to provide at least 60% crown cover and at least 500' wide.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was early succession habitat in forested habitat types. The Forest Plan EIS did not define or describe early succession habitat with regard to MIS. Early succession generally refers to forested habitats in the non-stocked or seedling/sapling stages of regeneration.

The Forest Plan EIS shows a total of 145,428 acres of timber in age class 1-40 years old (USDA Forest Service 1987b, p. 150). This age group represents non-stocked stands (VSS1) and seedling/sapling stands (VSS2). In addition, there were 252,660 acres of mountain and prairie grasslands. Combined, these habitat types totaled 19.8% of the Apache-Sitgreaves NF. In 1996, based on FIA data there were about 244,781 acres of grasslands and 138,786 acres of non-stocked and seedling/sapling stands, or about 19% of the Forest. These figures are displayed in Figure 4.

The "Habitat Quality Index Model" (version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for the mule deer. Based on the 1996 Forest Inventory Assessment (FIA) data (USDA Forest Service 2003a) there was approximately 1,769,299 acres of suitable mule deer habitat on the Forest. This is an increase from 1987 when the FLMP identified 1,447,263 acres as suitable habitat, 836,238 of which were in forested land and 611,025 acres were in woodlands. The overall habitat quality rating was 60% (i.e. the habitat will support 60% of maximum potential populations). The summer foraging habitat quality rating was 50% and the summer cover habitat quality rating was 60%. The winter foraging habitat quality rating is 60% and the summer cover habitat quality rating is 60%

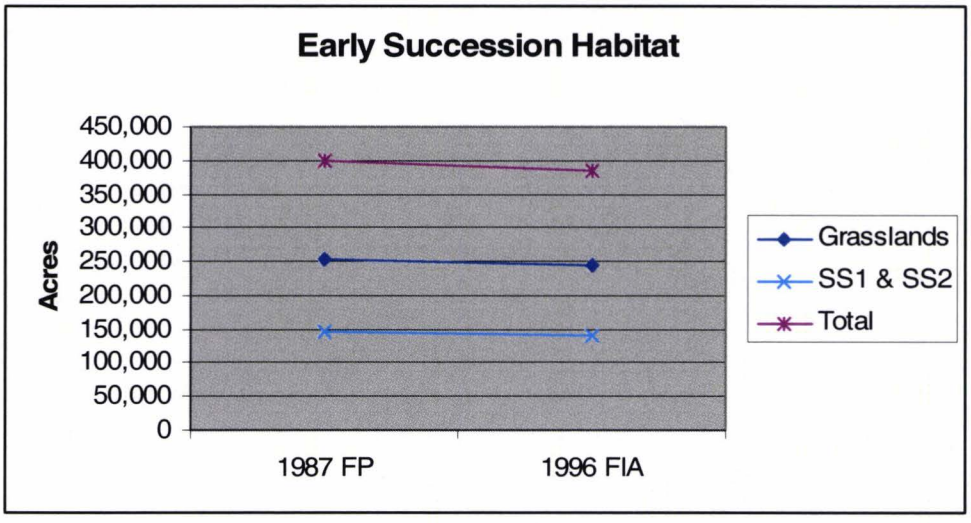


Figure 2.Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-1996)

Both wildfire and timber harvest can also affect the amount of early-succession habitat. Timber harvest, especially clearcuts, can create early-succession habitat. However, clearcuts were never a very large percentage of the timber harvest program in the Apache-Sitgreaves NF. Since 1985, clearcuts constituted less than 1% of the timber treatments in the Forest (Beal unpub. data). Therefore, it is unlikely that declines in the timber harvest program will have any effect on the availability or trend of early-succession habitat across the Forest.

Wildfire has much greater potential to create early-succession habitat. Such was the case with the Rodeo-Chediski fire of 2002. The fire burned over 173,000 acres, converting 55% of that area back to early-succession habitat (USDA Forest Service 2003b). Figure 5 shows the changes to early-succession habitat in the Forest by 2004

due to the Rodeo-Chediski fire. Forage and hiding cover declined after the fire for big game species such as mule deer. On most forested ranges fire enhances grass/forb growth and shrubs such as *Ceanthus spp.*, mountain mahogany and other hardwood species. Thus low intensity fire is considered desirable for mule deer habitat (Grifantini, 1991). Deer will use areas closer to cover. Most (54%) of the moderate to high-density deer habitat in the Rodeo-Chediski fire area burned under low intensity fire benefiting mule deer. The remaining 46% of the high-density big game habitat burned under moderate to high severity conditions. Habitat that burned under moderate to high severity will have little or no habitat value in the short-term (1-5 years) because grass and forbs are very sparse. Thus the forage capacity for mule deer has declined in the short-term compared to pre-fire conditions (USDA Forest Service 2003b). Long-term these areas could provide high quality forage for mule deer.

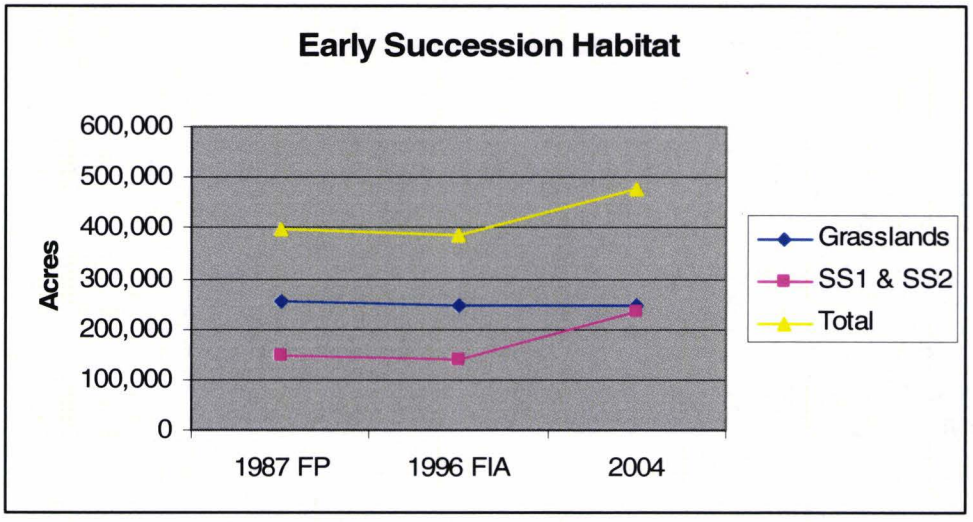


Figure 3. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-2004).

Early-succession habitat is by definition a transitory state except in grassland communities. Non-stocked stands and seedling/sapling areas eventually grow back into forested stands. The vast majority of the early-succession stands in the forest are in ponderosa pine, pinyon-juniper and juniper habitat types. As displayed in Figure 2, these habitat types show large net growths indicating that early-succession areas have the potential to quickly grow into later succession stages. However, the early-succession habitat created by the Rodeo-Chediski fire may be an exception. Many of the burned areas are very large and are not expected to become reestablished with trees for many years, possibly even centuries (USDA Forest Service 2003b). These areas may persist as early-succession habitat for a very long time.

Based on the information currently available **there appears to be an upward trend in the amount of early-succession habitat** due primarily to the effects of wildfire. **The trend in the quality of early-succession habitat appears to be stable.**

POPULATION TREND

The mule deer (*Odocoileus hemionus*) is a wide-ranging species in North America (see Figure 6). Throughout its range, the mule deer is listed as G5, (i.e., globally secure and common, widespread, and abundant) although it may be rare in parts of its range, particularly on the periphery. It is not vulnerable in most of its range. Within the United States, it is listed as N5, that is, it is secure and common, widespread, and abundant within the United States (NatureServe Explorer 2005).

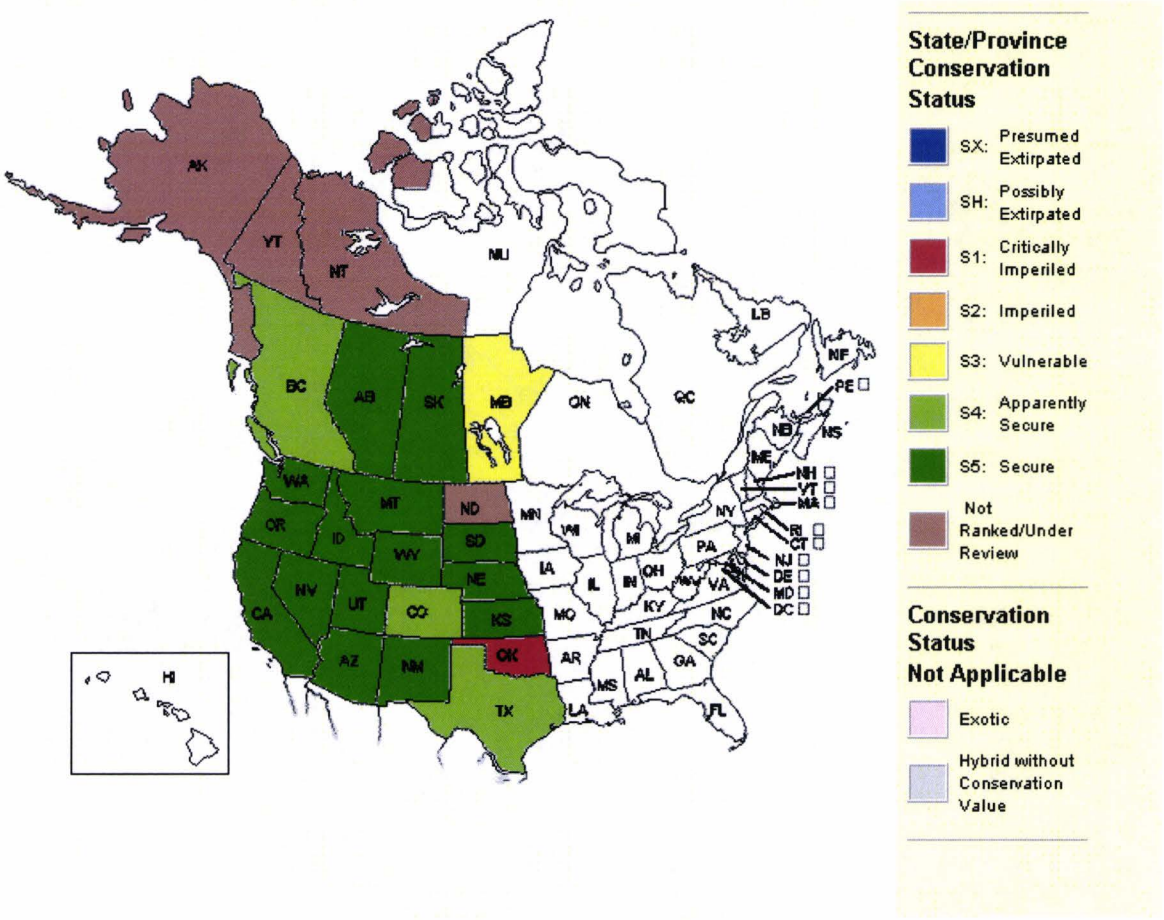


Figure 4. Distribution and conservation status of mule deer in the United States.

Arizona

In Arizona, the mule deer are listed as S5 by Natureserve, which means that it is secure, common, widespread and abundant within the state (Natureserve 2001).
Figure 7 displays the results of Arizona Game and Fish Department (AZG&F) surveys. The graph reflects the total number of mule deer counted from 1987 thru 2001 and the average during statewide surveys. Since 1970 the average number of mule deer counted statewide by AZG&F is 12,650. The population peaked during the mid-1980s in response to favorable precipitation and good fawn survival (Dave Cagle, pers. comm.). Since the early 1990s the statewide population has been in a decline. Currently there appears to be a downward trend in the Arizona mule deer population.

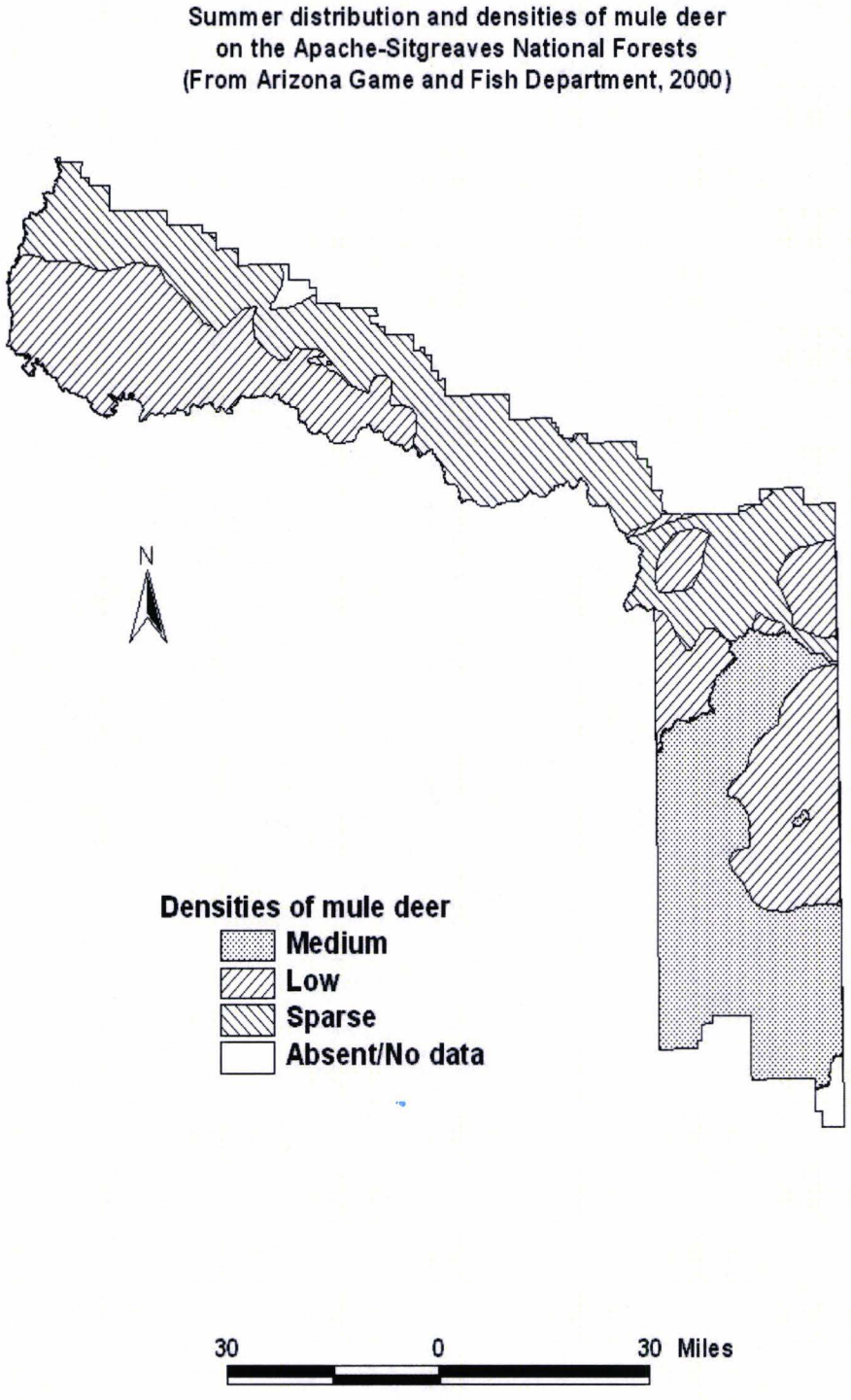


Figure 5. Winter range of mule deer in the Apache-Sitgreaves NF.

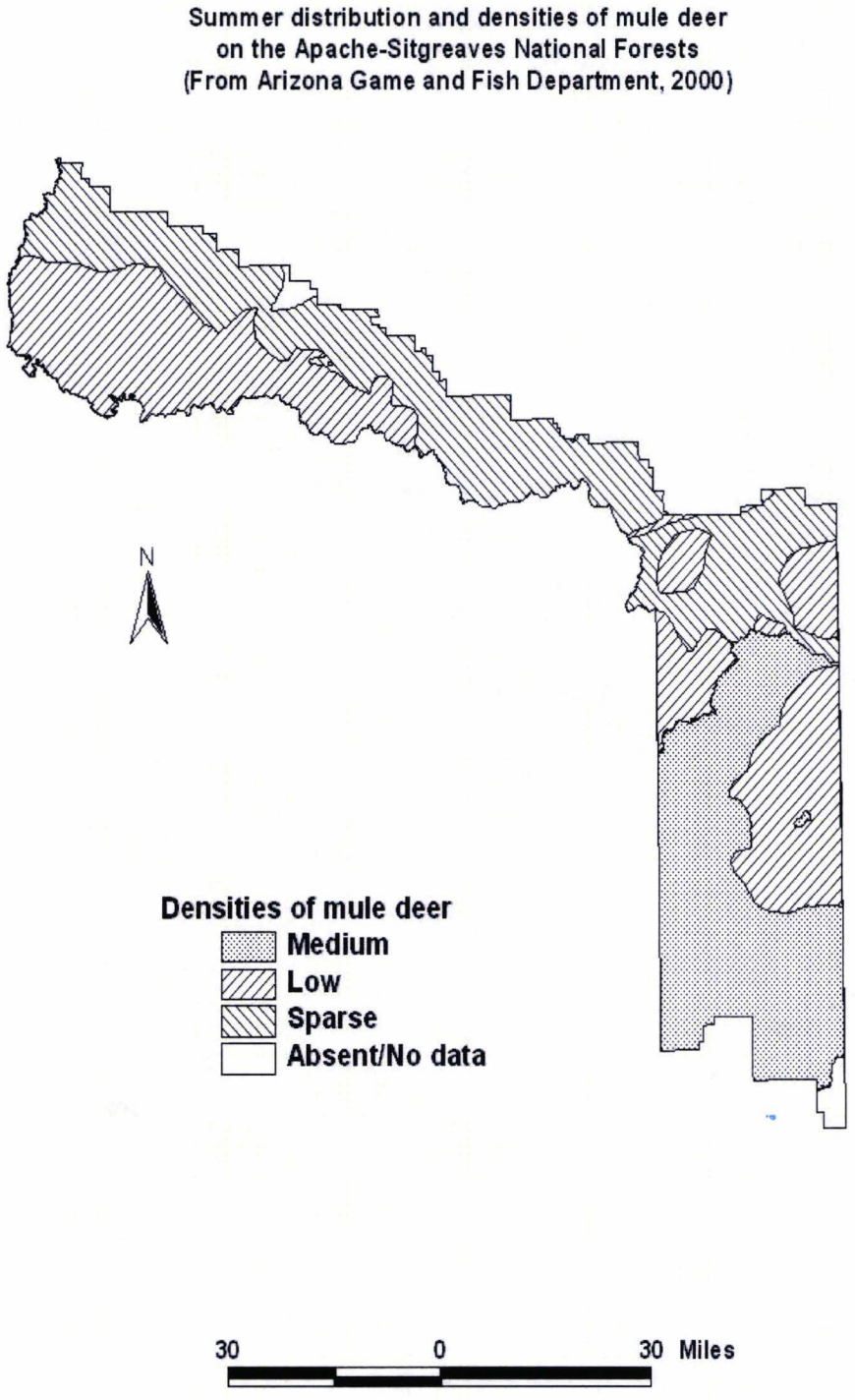
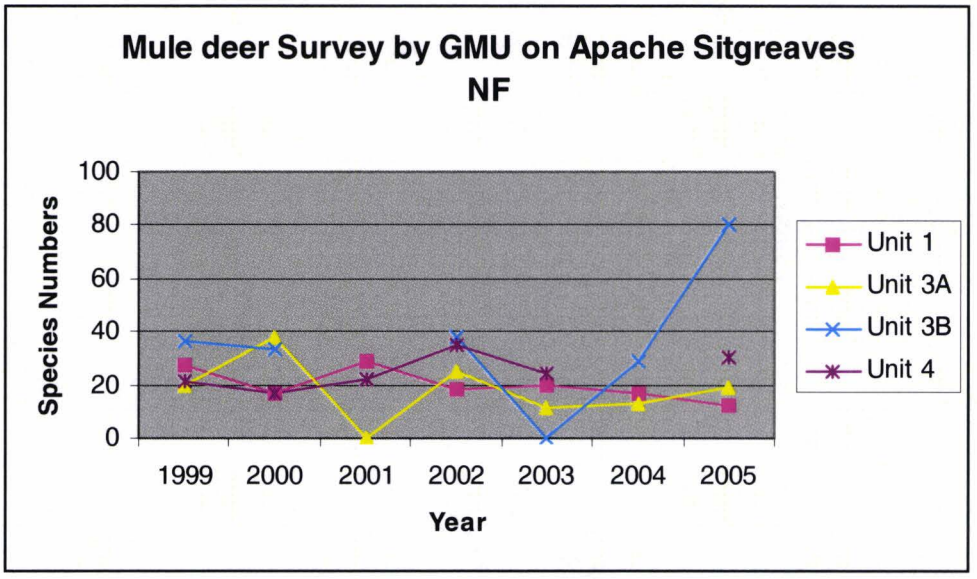
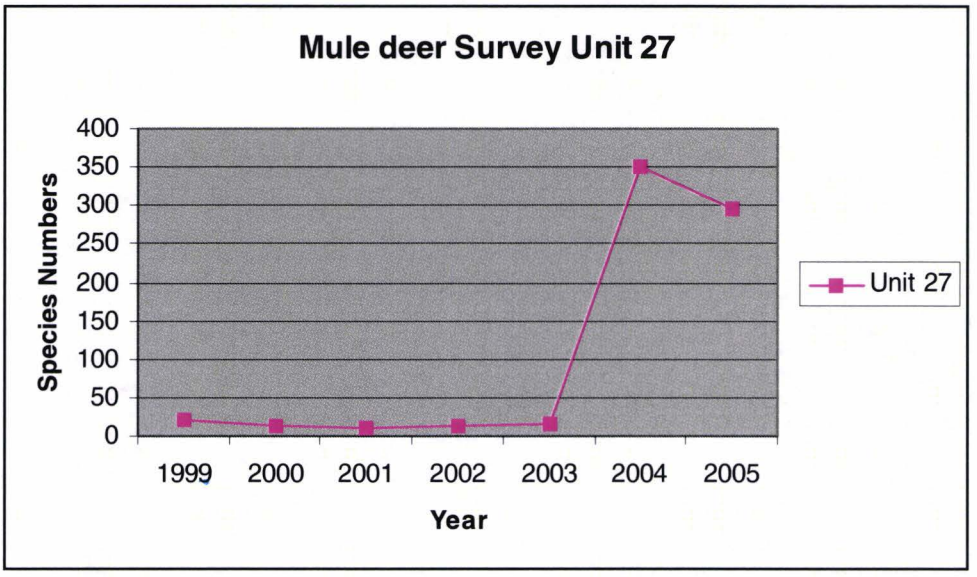
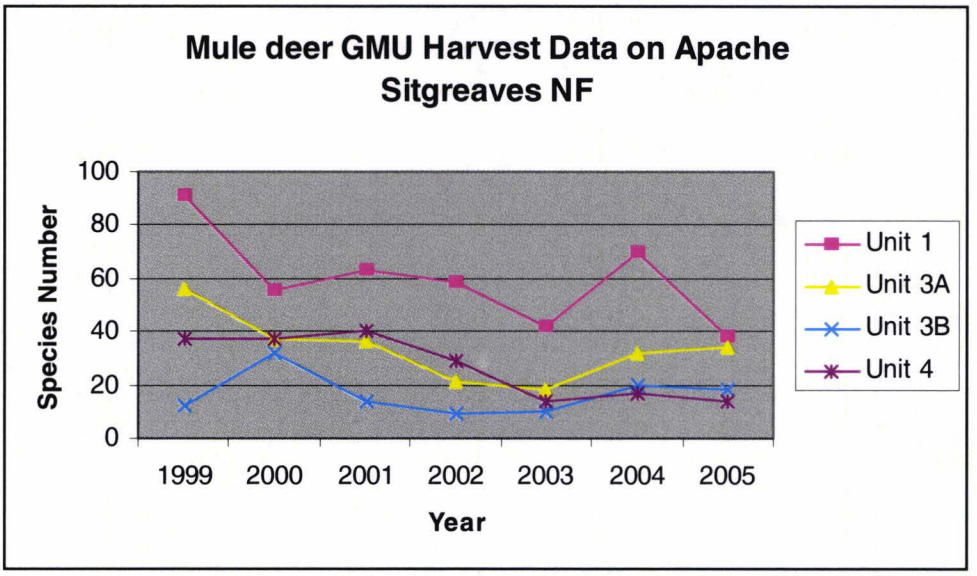


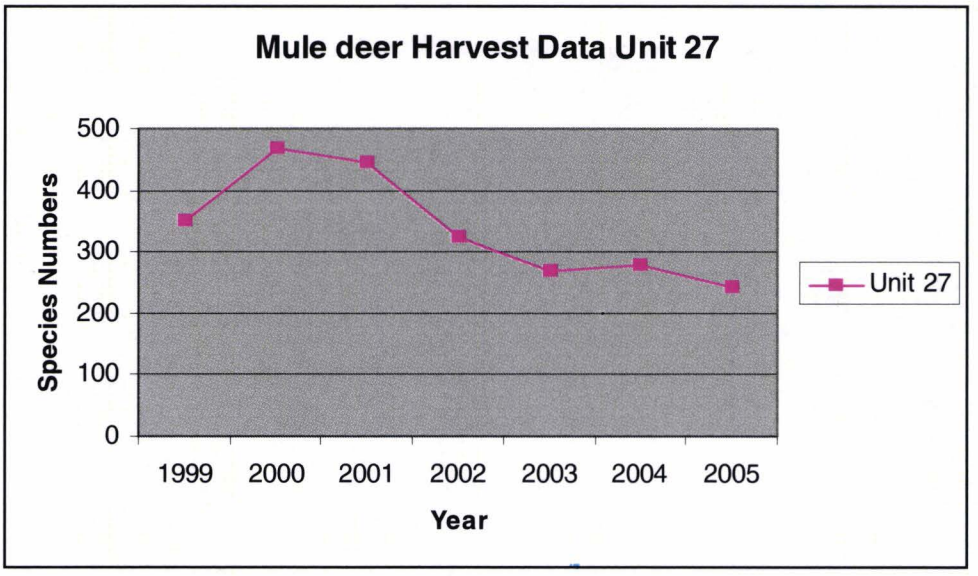
Figure 6. Summer ranges of mule deer in the Apache-Sitgreaves NF.

Table 1: Mule deer survey and harvest data for the Apache-Sitgreaves National Forest, by Game Management Unit, updated for 1999 through 2005.









Currently, **mule deer populations in the Apache-Sitgreaves National Forest are considered to be in a downward trend**. Declining mule deer populations throughout the Southwest are a concern for state and federal land managers alike. Statewide population estimates since the 80's indicate a low in the early 80's with a peak in the late 80's and a subsequent decline in the mid 90's approaching the low of the early 80's (AGFD 1995). Reasons for the more recent decline in populations are possibly correlated with unfavorable precipitation patterns, habitat succession, and additive mortality from predation during depressed prey population levels (Dave Cagle, pers. comm.). LeCount (1977) suggested that low planes of nutrition for pregnant and lactating does during years of extreme drought might have a significant effect on fawn survival. Severson and Medina (1983) suggest that in the southwest, failure of winter and/or summer precipitation results in a corresponding reduction in plant growth, which

during either period can affect deer populations. Drought during either period can force deer to alter their diets significantly (Anthony 1976), which may reduce deer populations by decreasing fecundity and fawn survival.

Taking into account the continuing occurrence of the mule deer across the Forest in suitable habitat, the abundance and wide distribution of suitable habitats across the Forest, upward habitat trends for early succession habitat in the Forest, it appears that the Forest supports a well distributed reproducing population of this species. The downward trend of survey and harvest data, however, indicates that the species' population is in decline, and has been in a slow downward trend since about 1995.

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Goshawk (*Accipiter gentilis*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves NF, the northern goshawk (*Accipiter gentilis*) is a management indicator species for late succession. The goshawk is a resident of coniferous and mixed-hardwood forests across North American and Eurasia (NatureServe 2001, DeGraaf et al. 1991). In the early 1980s, the species was reported as "a sparse to uncommon resident of the eastern and central mountains, and the Kaibab Plateau" in Arizona (Monson and Phillips 1981). As a result of more recent surveys for the species on those lands administered by the U.S. Forest Service in Arizona, the species might be considered as a sparse, but regularly occurring species of forested habitats in the north and central forests, requiring a home range of 1,400 to 8,650 acres during breeding.

Latta et al. (1999) discuss various ecological aspects of goshawks. Goshawks generally nest in mature and old growth forest stands with relatively high canopy closure, primarily using ponderosa pine and mixed-conifer forests in the southwest. Goshawks are sensitive to human disturbance during the incubation period. Excessive disturbance can cause nest abandonment. Reynolds et al. (2004) found that nest site availability was not limiting the goshawk population on the north Kaibab National Forest. Rather territoriality appeared to set the upper limit to the nesting population. Habitat for foraging generally consists of moderately dense, mature forests with greater than 40% canopy closure (Beier and Drennan 1997). These researchers found that prey availability was more important than prey abundance in goshawk foraging site selection. Goshawks prey on a variety of birds and small mammals, especially squirrels, woodpeckers, jays, and robins. In a subsequent study, Drennan and Beier (2003) found that in contrast to high prey diversity noted during breeding season, wintering goshawks specialized in only two species of large-bodied prey: cottontails (*Sylvilagus spp.*) and Abert's squirrel (*Sciurus aberti*). It is also important to note that while some habitats may be avoided by foraging goshawks, they may actually be important in terms of prey production (Boal et al. 2002).

Timber harvest has been considered a principal threat to breeding populations (Squires and Reynolds 1997, Kennedy 2003, La Sorte et al. 2004). In addition to the relatively long-term impacts of removing nest trees and degrading habitat by reducing stand density and canopy cover, logging activities conducted near nests during the incubation and nestling periods can cause nest failure due to abandonment (Boal and Mannan 1994, Squires and Reynolds 1997). Following canopy reduction by logging, goshawks are often replaced by other raptors including red-tailed hawk (*Buteo jamaicensis*), great horned owl (*Bubo virginianus*), and long-eared owl (*Asio otus*) (Crocker-Bedford 1990, Erdman et al. 1998). However, a number of authors (Reynolds et al. 1992, Hargis et al. 1994, Reynolds 2004) suggest that timber harvest can be compatible with goshawk conservation if stands of mature timber, older trees, and forest edge are provided.

Fire suppression, grazing, and insect and tree disease outbreaks can result in the deterioration or loss of nesting habitat (Graham et al. 1999). The incursion of Great Horned Owls is especially significant as they prey on both adult and nestling goshawks (Boal and Mannan 1994, Erdman et al. 1998, Rohner and Doyle 1992). Declines in prey populations associated with changes in forest structure could also contribute to goshawk population changes (Reynolds et al. 1992). Given results of wildfires in the past few years, catastrophic fire is also considered a principal threat.

Management Activities or Natural Events That May Affect Habitat

Negative: Timber harvest that opens forest canopies and converts mature and late-succession stands to earlier succession; large-scale wildfires; insect epidemics.

Positive: Protection of large, mature to old-growth forest tracts; maintaining large trees for future down logs and snags; fire suppression.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (USDA Forest Serviced 1987a), includes specific "Standards and Guidelines" that are expected to help maintain or improve goshawk habitat components including:

- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement p. 122-2).
- Minimum snag criteria used to determine old growth include 1 snag/acre in ponderosa pine, 2.5 snags/acre in mixed-conifer, and 3 to 4 snags/acre in spruce-fir. No minimum criteria are identified for identifying aspen old growth (p. 122-2).
- Implementing the Forest snag policy, providing at least 55% of a diversity unit with at least 180 snags per 100 acres. In high-priority areas, including both edge habitats adjacent to meadows or water, manage for an average of 280 snags per 100 acres. Only ponderosa pine/mixed-conifer species will be counted toward meeting minimum snag requirements (p. 122-3).
- *Record of Decision for Amendment of Forest Plans* (1996) provides guidelines relative to the management of both Mexican spotted owl and northern goshawk habitat.

  Standards for ecosystem management in northern goshawk habitat include:

  > *Manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape. Provide foods and cover for goshawk prey* (USDA 1996, p. 91).

- Direction for the management of "old growth" habitats including well-defined, minimum criteria. Specifically, the amendment directs the allocation of "no less than 20 percent of each forested ecosystem management area to old growth" where "allocations will consist of landscape percentages meeting old growth conditions and not specific acres" (p. 122).
- Direction that defines vegetative objectives for PFAs.
- Direction extending the management of "Foraging Areas" to all forested landscapes outside PFAs with well defined objectives for vegetative structure. Management direction for snag densities, canopy-cover and other forest parameters are defined at the landscape level to promote sustainable prey populations for goshawks (e.g. related to snag densities) in addition meeting cover requirements for goshawks during the breeding season.
- Direction related to snag and down wood densities to promote sustainable prey populations specifically includes:
  - ✓ Leave at least 2 snags/acre and 3 downed logs/acre in ponderosa pine forests.
  - ✓ Leave at least 3 snags/acre and 5 downed logs/acre in mixed-conifer forests.

- ✓ Leave at least 3 snags/acre and 5 downed logs/acre in spruce-fir forests.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was late succession. The Forest Plan EIS defines old growth for various forest vegetation types (USDA Forest Service 1987b, p. 299) based on the number and size of large trees, multiple canopy layers, snags, and down logs. The Forest Plan EIS discusses old growth deficits in the Sitgreaves NF (p. 229). The FEIS mentions that the goal for late-succession wildlife habitat is 21% (p. 200). The age class distribution of timber from the Forest Plan EIS (p. 150) shows that in 1987, the Forest had about 87,331 acres (10.8%) in stands greater than 140 years old. The Forest Plan specifies that 20% of each diversity unit is to be allocated old growth (USDA Forest Service 1987a, p. 122-2). Therefore, the goal of the Forest Plan was to increase old growth in the Forest.

In 1996, the FIA data indicated that there were 308,535 (17.4%) acres of stands greater than 150 years old at that time with 62,611 acres (3.5%) being 200 years or older. Based on this information it appears that there has been an increase in the acres of older stands of trees. However it is more likely that this difference in the number of acres of old trees is due to better data collections methods in use today versus at the time of the Forest Plan. FIA data is a forestwide sampling scheme that does not collect data on each forested stand but rather a stratified random sample of stands. The Forest does not have a complete forest inventory of what is current old growth based on stand exam data because stand exam data is not available for all areas of the Forest.

The Forest Plan requires designation of 20% of each forest cover type to be managed toward old growth. The Forest has done that on a project-by-project basis as vegetation treatments are planned. These designated old growth management stands are available in a GIS coverage. A total of 74,943 acres have been designated across the Forests. This represents bout four percent of the forested areas.

There are other factors to consider in making a determination of trend for late-succession habitat. Both natural and human events can affect forest succession. Timber harvest can reduce the amount of existing and developing late-succession habitat. The Forest Plan EIS considered effects to old growth in developing the Allowable Sale Quantity authorized under each alternative. The Forest Plan authorized about 18,000 acres of timber harvest annually. The figure below depicts the levels of projected versus actual timber harvest over the life of the Forest Plan. Actual harvest information is from Forest records (Beal unpub. data). The projected harvest is based on the figure listed in the Forest Plan EIS for Alternative D of 18,080 acres annually (USDA Forest Service 1987b, p. 199). Actual harvest has varied considerably between years but has been declining overall as shown by the trend line in the graph below (see Figure 1). The recent spike in timber harvest was due primarily to salvage harvest in the Rodeo-Chediski fire. As such, it doesn't truly represent a potential effect on late-succession habitat from timber harvest. The fire itself caused loss of old growth.

The "Habitat Quality Index Model" (version 18) (HQI), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for goshawks. Coefficients for this model were based on those used in the "R03WILD Habitat Capability Index Model", and were specific to the vegetative structure of ponderosa pine, mixed-conifer, spruce-fir, aspen, and pinyon-juniper forests, and riparian communities. Among these cover types, mature stands of ponderosa pine and mixed conifer were considered most valuable to the species. Coefficients were reviewed by Arizona Game & Fish Department, Pinetop Region, personnel. The distribution (acres) of forest structure (e.g. vegetative structural stage,

even/uneven age-class) by cover type was derived from the 1996 Forest Inventory and Analysis (FIA) data and analyzed by the Forest Silviculturist.

Based on the FIA data set and coefficients, the model recognized 1,682,492 acres of year-round habitat that provide some value for foraging by the species. Among these "foraging acres", the model recognized 982,514 acres of year-round habitat that provide some cover value for the species. The habitat quality index (HQI) generated by this model indicates that the Forest, as of 1996, provided overall habitat capability at about 40% of its potential for goshawks. This value indicates a general compliance with Forest Plan objective to maintain or achieve at least 40% of the potential habitat capability for management indicator species (p. 74). Specifically, the model indicated that foraging habitat was at 60% of its potential, and habitat used for cover was at 30% of its potential.

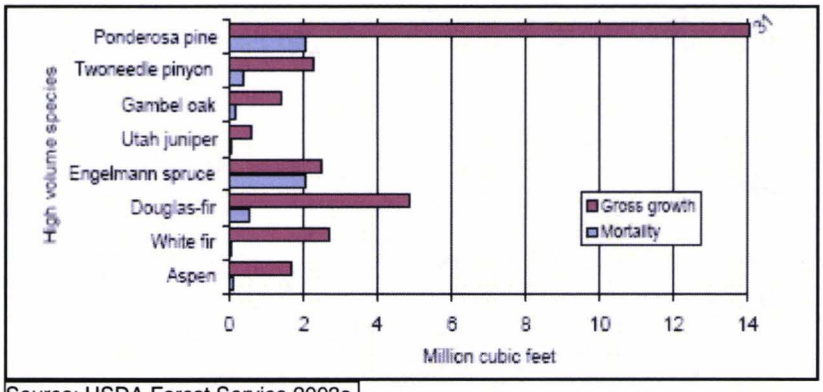
Since the FIA data was collected, both timber harvest and wildfires have affected ponderosa pine forests. Total annual timber harvest history in the Forest is shown in Figure 1. From 1985 through 2001, about 171,124 acres of mid- and high-elevation coniferous forests were impacted by the mechanical removal of trees (see Table 1), averaging about 10,000 acres per year. No information is available indicating the structural stage characteristics of these acres prior to mechanical treatment that would permit evaluating the impacts of these actions to the habitat capability of the forests for goshawks. However, seed cuts, overstory removals, and intermediate treatments all tend to open canopies over entire stands, adversely affecting desirable habitat characteristics. The Forests adopted uneven-aged management in 1996 when Amendment 6 was implemented. As shown in Table 1 there haven't been many seed cuts or overstory removals since the timber harvest injunction in 1995. Uneven-aged management, as recommended by Reynolds et al. (1992), is now the norm. The Forests should be moving toward desired vegetative structural stage distributions.

Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

Table 1. Summary of vegetative treatments in potential northern goshawk habitat on the Apache-Sitgreaves National Forests (Beal unpub. data).

Another factor in the development of old growth across the Forest is the annual rate of forest growth. The FIA report (USDA Forest Service 2003a) discusses the net annual growth of trees in the Forest by comparing estimated gross annual growth and gross annual mortality. Total mortality is about 13% of total annual growth. Figure 2 compares gross annual growth to

mortality for eight common forest types. Growth in most types, except Englemann spruce, far outstrips mortality in the Apache-Sitgreaves NF. Thus, the forest is getting older and thicker over time. This is another indication that late succession is continuing to develop in the Forest.



Source: USDA Forest Service 2003a.

Figure 1. Gross annual growth of live trees 5 inches diameter and greater compared to mortality on all forested land, Apache-Sitgreaves NF, 1996.

Wildfires have also affected mature and late-succession forests, especially the Rodeo-Chediski fire. Since 1985, acreage burned in the Apache-Sitgreaves National Forests from wildfires totaled less than 2,000 acres per year for 11 years out of 18 (Figure 3). From 1985 to 1996, wildfires impacted about 5,356 acres each year in the Forests. From 1997 to 2001 (after FIA data collection), an average of 1,477 acres each year have been impacted to some extent by wildfires in the Forests. Information is not available summarizing cover types impacted by these fires, or the acreage actually impacted by "high-intensity" conflagrations. However, it is likely that high-intensity fires impacted only a small percentage of these acres (J. Thompson, pers. comm.). Likewise, not all of the acres impacted by high-intensity fires were in habitats important for goshawks. Given the wide distribution of goshawks across the Forests (Figure 9), the continued recurrence of wildfires, as observed from 1985 to 2001, is not likely to significantly reduce or fragment the distribution of goshawks in the Forests. In addition, this type of fire regime is also not likely to reduce the overall habitat capability for goshawks to levels where the Forests are no longer able to provide habitat to sustain a reproducing population of the species.

Catastrophic fires, such at the Rodeo-Chediski wildfires of 2002, may cause landscape-wide modifications to the habitat capability of the Forests for goshawks. During the Rodeo-Chediski fires, a total of about 18,960 acres of mid-aged, mature, and late-succession forests burned at high or moderate severity, reducing or eliminating the forests' value to goshawks for nesting purposes. However, increases in foraging habitat in proximity to lightly burned or unburned stands within the fire perimeter likely increases the habitat value of those stands. The Rodeo-Chediski Fire Salvage analysis (USDA Forest Service 2003b) indicated that habitat capability for goshawks decreased as a result of the fire. The FEIS states:

> *"The current HQI modeling for goshawk foraging habitat is at 80 percent of its potential, compared to 70 percent pre-fire. This is due to an increase of 28 percent in high quality foraging habitat created by the fire on 117,185 acres, based on the opening of forested stands. Fires favor raptors by reducing hiding cover and exposing prey. Raptor populations may increase when more food is available with in area; thus the results*

> *from the model are consistent with other studies showing raptors are unaffected by or respond favorably to burned habitat (Smith, 2000).*
>
> *The fire reduced the availability of good nesting cover by 48%, from 36, 183 acres to 17,574 acres. The resulting HQI for goshawk nesting habitat is at about 10% of its potential compared with 30 percent pre-fire. Overall the HQI value is now at 30 percent. The low HQI suggests that the continued presence of reproducing goshawks in the analysis areas may be uncertain according to the model estimates. Even with the reduction in the amount of nesting cover, biologists agree that some nesting activity will continue within the analysis area."*

There were 24 established "post fledging-family areas" (PFAs) located within the analysis area. Twenty of these PFAs were visited in 2003, the year following the fire. Three active nests were found in established PFAs. One new PFA with a nesting pair was established also located within burn perimeter. There are also two additional PFAs straddling the burn boundary. Goshawk nesting was low throughout the burn area in 2003 (USDA Forest Service 2003b).

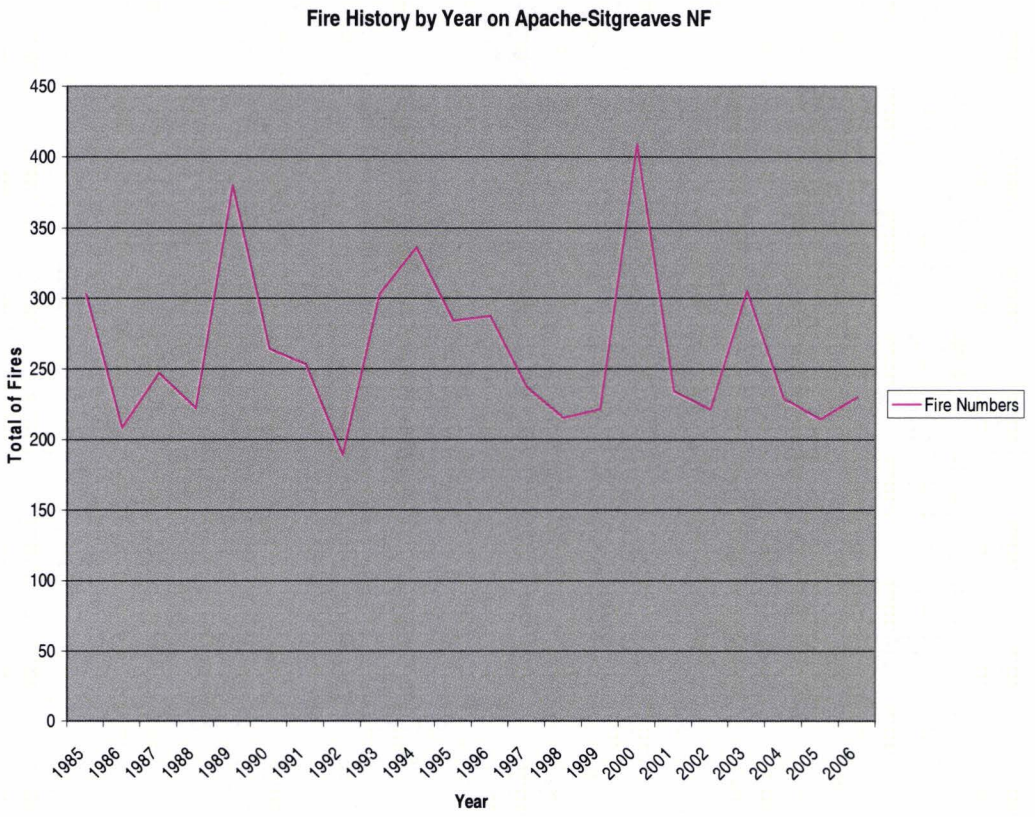


Figure 2. Summary of fires annually by wildfire and prescribed burn on the Apache-Sitgreaves NF (1985-2006).

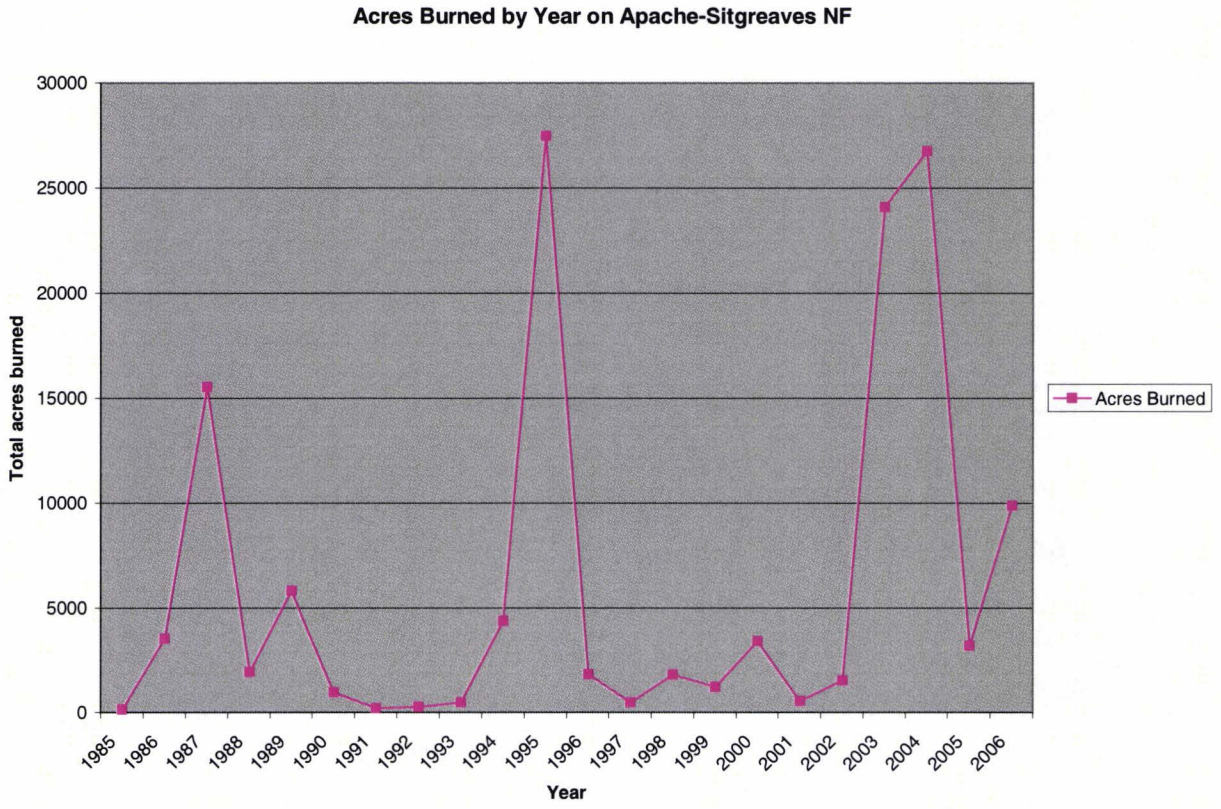


Figure 4. Summary of acres burned annually by wildfire and prescribed burn on the Apache-Sitgreaves NF (1985-2006). Actual figure in 2002 was 173,000 acres due to the Rodeo-Chediski fire.

Goshawk habitat can also be lost to large scale forest insect infestations. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004a). The results of the surveys are displayed in Figure 4. Infestations vary widely from year to year and continue to be present in the Forest at mostly endemic levels. However, a widespread outbreak among ponderosa pine has been documented in 2002 attributable to bark beetles, causing tree mortality on about 110,000 acres and killing an estimated 226,000 trees. The impact to goshawks from this die-off is likely small and may be beneficial. For example, the average density of trees killed was about 2 trees per acre. If these trees generally meet the definition of a snag, and are fairly regularly distributed across the landscape, the result of this die-off may bring much of the ponderosa pine type into compliance with Forest Plan objectives for snag densities in this cover type, favoring an increase in goshawk prey species. If the dead trees are in the smaller size-classes, then the die-off may not offer much benefit to goshawks.

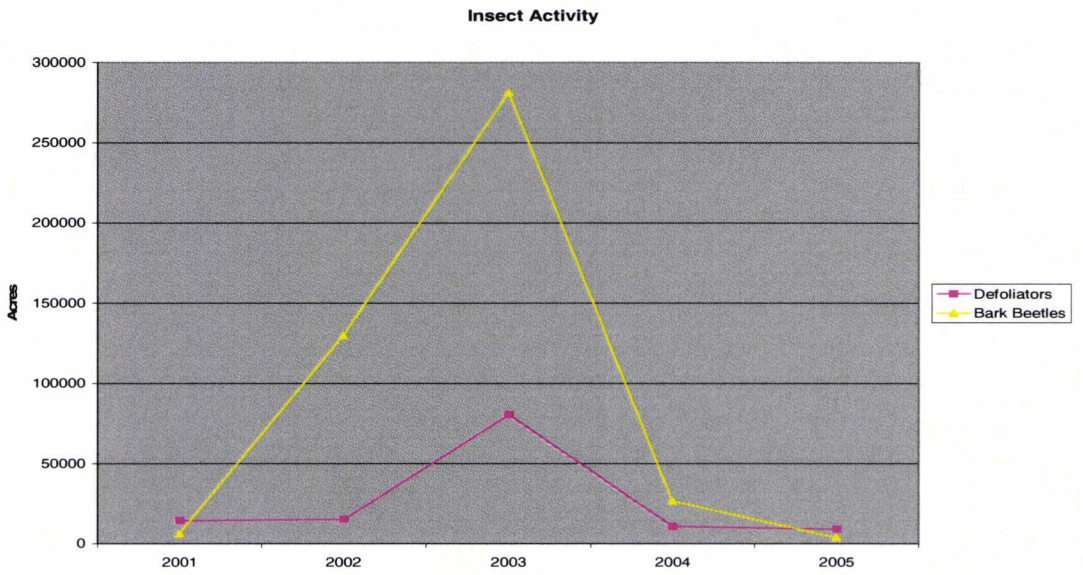


Figure 5. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2005).

Based on the information, available **habitat quality for the goshawk is fair with a slight downward trend** due to recent wildfires. **Habitat on unburned portions of the Forests is likely improving** due to protection of existing and potential old growth areas, decreasing harvest levels, and high net annual growth rate. However, actual improvements in the quality of late succession management areas will take many decades. **The upward trend in habitat will be slow.** The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

POPULATION TREND

Goshawks are year-round residents of pine forests and woodlands, especially ponderosa pine, and less frequently pinyon-juniper (NatureServe 2005). The goshawk is a widely distributed resident across North America (Figure 5), occurring from southern interior British Columbia south in mountains to central Mexico (NatureServe 2005). The Global Heritage State rank for goshawk is G5 (i.e. globally secure and common, widespread, and abundant) across its range. It has a large range and is common in many areas; although there are conservation concerns in some states (Figure 5). In the United States, goshawk populations are ranked N5 (secure).

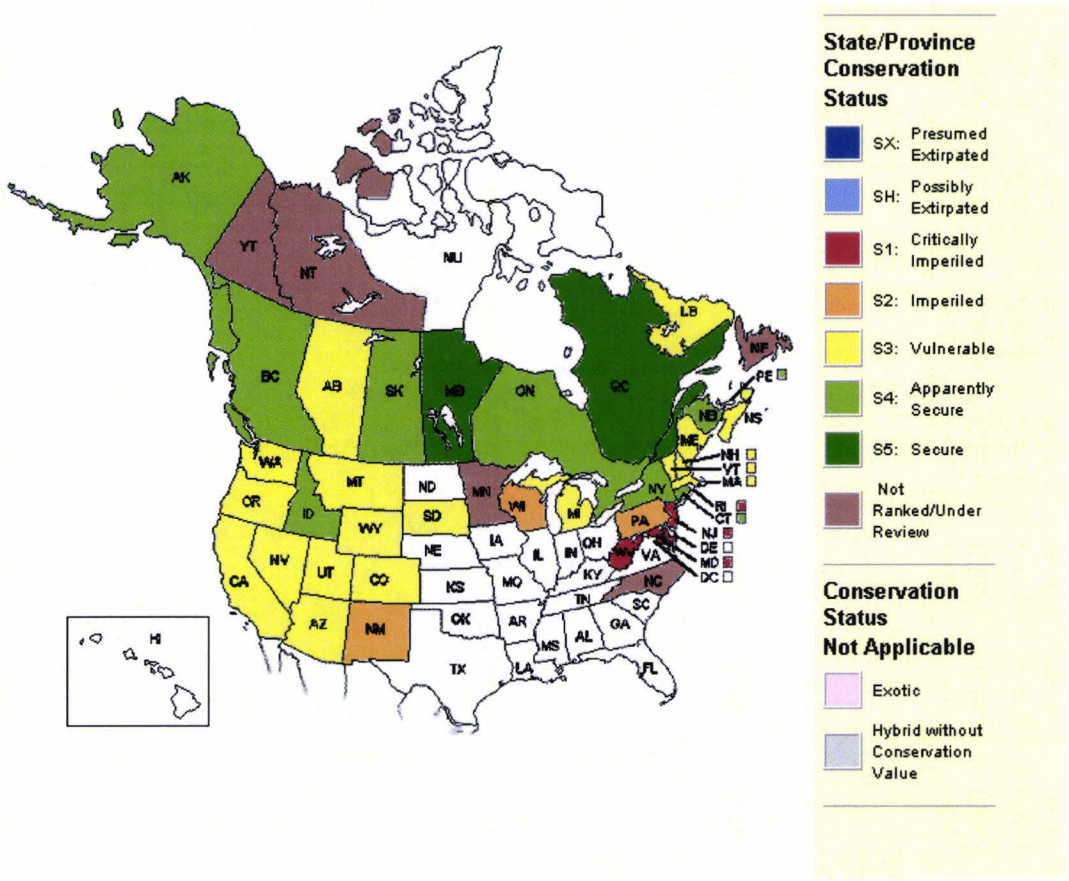


Figure 6. Distribution map of the goshawk in North America displaying conservation status by State.

Overall, the U.S. goshawk population appears stable (-0.09, p=.90932) (Sauer et al. 2004). However, populations trends are difficult to determine due to the paucity of historic quantitative data and because of biases inherent in the various methodologies used to track bird populations. Nesting range in the eastern U.S. is currently expanding as second-growth forests mature (Squires and Reynolds 1997). In the west, clearcut logging of old-growth forests, fire suppression, and catastrophic fire are postulated to be reducing habitat and thus populations (USFWS 1998). However, conclusive data supporting the purported decline in the western U.S. are lacking (USFWS 1998, Kennedy 1997). Christmas Bird Count (CBC) data (1959-1988; Sauer et al. 1996), North American Breeding Bird Survey (BBS) data (1966-2004; Sauer et al. 2004), and counts of migrants in the eastern U.S. (1972-1987; Titus and Fuller 1990) do not indicate any significant changes in populations. Data derived from CBC and BBS are difficult to interpret due to low sample sizes and the possibility that birds counted may not be a random sample of the breeding population. Counts from migration monitoring stations are complicated by population fluctuations resulting from periodic invasions of large numbers of birds (Bednarz et al. 1990, Titus and Fuller 1990, USFWS 1998).

Arizona

The Arizona Heritage status for the goshawk is S3 (i.e., vulnerable; NatureServe Explorer 2005).

Monitoring information from the North American Breeding Bird Surveys in Arizona (see Figure 6) indicates that goshawk populations and trend are stable (+19.02, p=0.03361) (Sauer et al. 2004). However this trend information is based on only five routes with very few observations per route. This trend estimate should not be considered significant for the reasons discussed above.

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The goshawk was identified as a species of concern in Arizona during that effort (Rosenberg 2004). Arizona PIF also identified the following statewide population objectives for the goshawk: "Maintain the current statewide population of 5,500 individuals." The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort also identified the goshawk as a species of concern in Sierra Madre Occidental region (BCR 34) that includes the Mogollon Rim of Arizona.

Apache-Sitgreaves National Forest

The goshawk is considered an uncommon permanent resident of the Apache-Sitgreaves NF and a rare resident of the adjacent Gila NF in New Mexico (USDA Forest Service 1996; USDA Forest Service 1997). However, the distribution map of nest locations and PFAs (see Figure 7) shows that the Forests are fairly well populated in the preferred habitat types of ponderosa pine and mixed conifer. Given the home range size and territoriality of the species, goshawks might be considered common on the Forests.

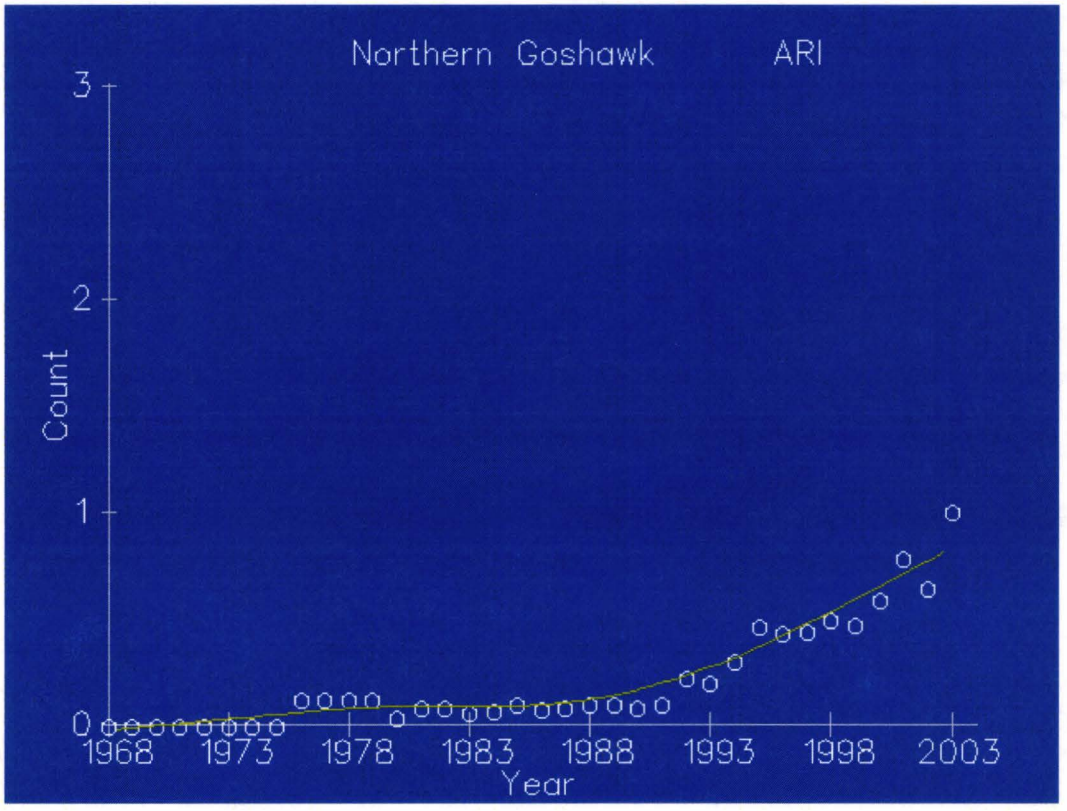


Figure 7. Estimated population trend for goshawk in Arizona (Sauer et al. 2004)

The Arizona Game and Fish Department (Arizona Game and Fish, unpub. data) surveyed a portion (i.e. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Of these, 65 sectors occurred on ASNF lands. Breeding goshawks were detected, from 1993 to 2000, at least once in 45 of these sectors distributed across the forest (Figure 9). A summary of habitat associated with each sighting may indicate the species is not as restricted to ponderosa pine forests as previously assumed. Habitats dominated by ponderosa pine accounted for about 39% of all habitat associations recorded during the ABBA surveys where breeding goshawks were detected in the Forests. Breeding individuals of the species were also found associated with mixed-conifer forests about 33% of the time. Other forest types (pinyon-juniper, riparian, aspen, spruce-fir) were associated with the species at about 28% of the sites. Mixed-conifer forests (and other forest types, collectively) appear to provide significant habitats for goshawks in the Forests.

The Forests have surveyed project areas for the presence of breeding goshawks since 1990 and have implemented measures to protect the breeding birds and habitats across the Forest landscape. To date, the Forests have delineated about 96 management territories encompassing more than 62,000 acres to protect nesting areas and their associated "post fledging-family areas" (PFAs) in compliance with the Forest Plan (Figure 7). About 75% of the breeding goshawks were discovered from 1989 to 1995 (Figure 8). In 2003 the Forests monitored 56 of these PFAs. Annual occupancy rates are generally low and nesting success has not been determined.

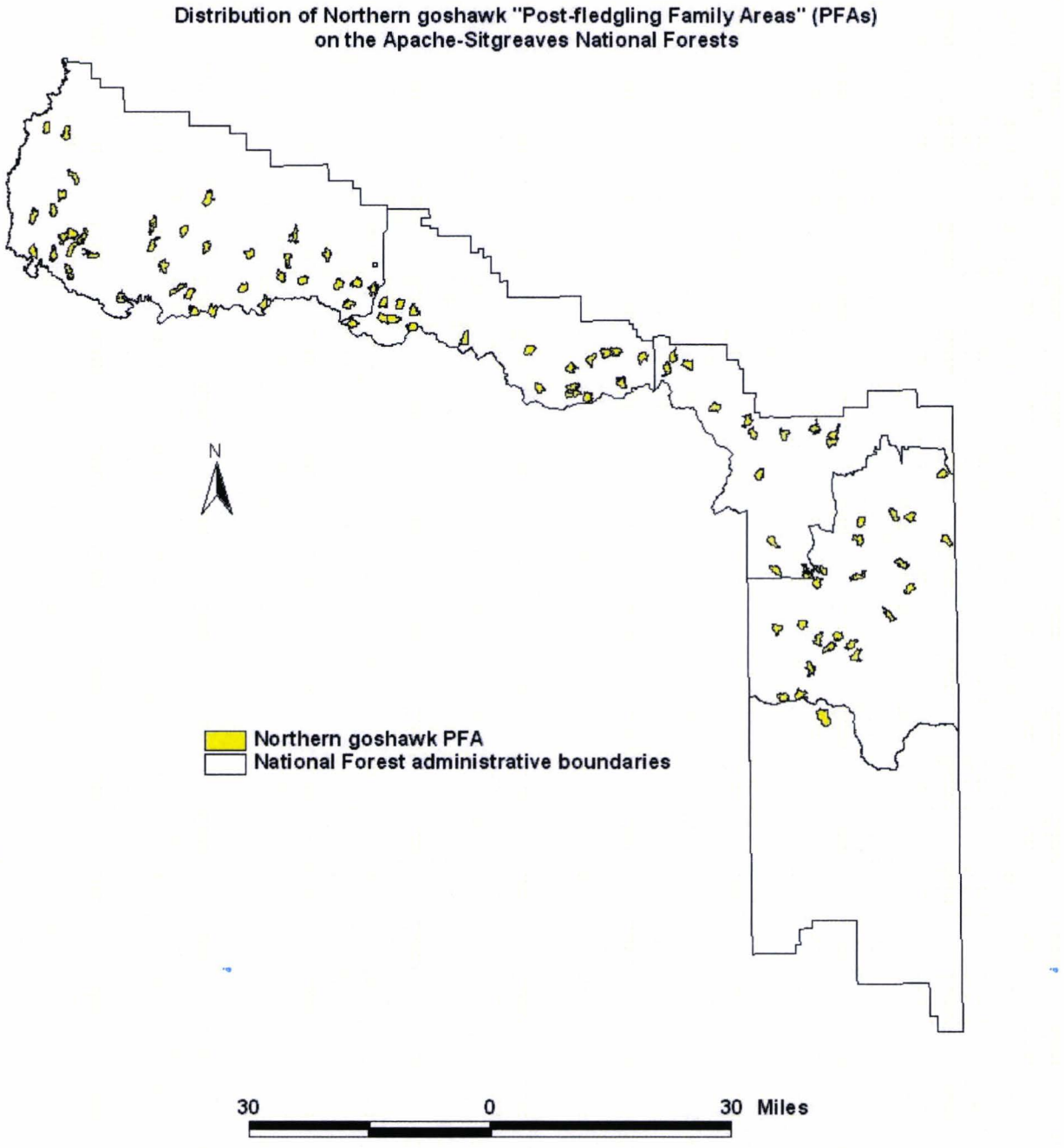


Figure 8. Distribution of Northern Goshawk "Post-Fledgling Family Areas" (PFAs) on the Apache-Sitgreaves National Forests.

The Arizona Game and Fish Department monitored goshawks on a portion of the Forests from 1993 to 1997 (Ingraldi 1998) with the assistance of Forest Service funding. The study involved locating nests and subsequently capturing or attempting to capture individuals (adults and

juveniles) near or in the nest. Nest trees were climbed to band and measure nestlings. Young females were captured and fitted with satellite transmitters. Adults at active nests were captured, bled, and fitted with individual colored identification bands.

Various parameters associated with reproductive success were evaluated in relation to other goshawk studies in the western United States. Although no statistical testing was applied to the data, values estimated for these parameters typically fell within the range of average values reported elsewhere (e.g. mean fledglings/active nest, mean fledglings/successful nest, nest success, post-fledging survivorship for juvenile females, survivorship rates for adult females).

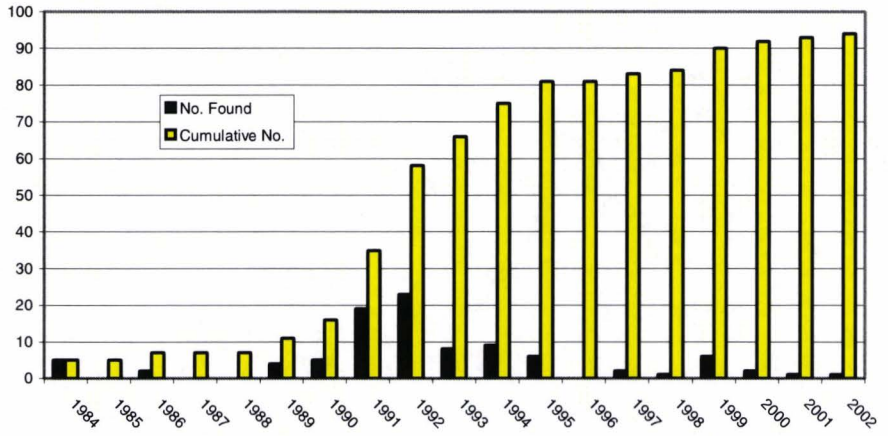


Figure 9. Cumulative total of known goshawk nests (yellow bars) and number of new nests (black bars) found on the Apache-Sitgreaves National Forests from 1990-2002. Note: Three new nests have been found since 2002.

In 1991 the U.S. Fish and Wildlife Service received a petition to add the northern goshawk to the endangered species list under the Endangered Species Act of 1973. After thorough review, in 1998, the Service declined to list the goshawk citing no evidence of declining population trend across the western United States (USFWS 1998). Specific to the Apache-Sitgreaves NF, the Service concluded "goshawks may be exhibiting signs of decline, although this is yet to be determined." With regards to goshawks across the Southwest, they summarized that "the goshawk appears to remain well distributed, and there is no data to indicate any extirpation."

Available information does indicate that goshawks are fairly well distributed in forested habitats on the Apache-Sitgreaves National Forests. Habitat capability for the species appears to be adequate, but marginal (HQI = 0.4) for the species. Taking into account the continuing occurrence of goshawks across the Forest in suitable habitats and the continued protection of areas known to be used by reproducing goshawks (i.e. PFAs), it appears that the forest supports a well distributed population of reproducing goshawks. **Currently, goshawk populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely lower than potential.** Based on habitat loss in the Rodeo-Chediski fire, a net decrease in active territories is expected as PFA monitoring in the burn continues. It is likely that several PFAs will be deleted from the map in the next year or two. However, there are several areas of good to excellent habitat that have never been surveyed (e.g. Chevelon Canyon, Leonard Canyon) where additional goshawk nesting territories may still be located.

Wildfire may continue to pose a risk to local populations on the Forests especially over the next decade (USDA Forest Service 2004b).

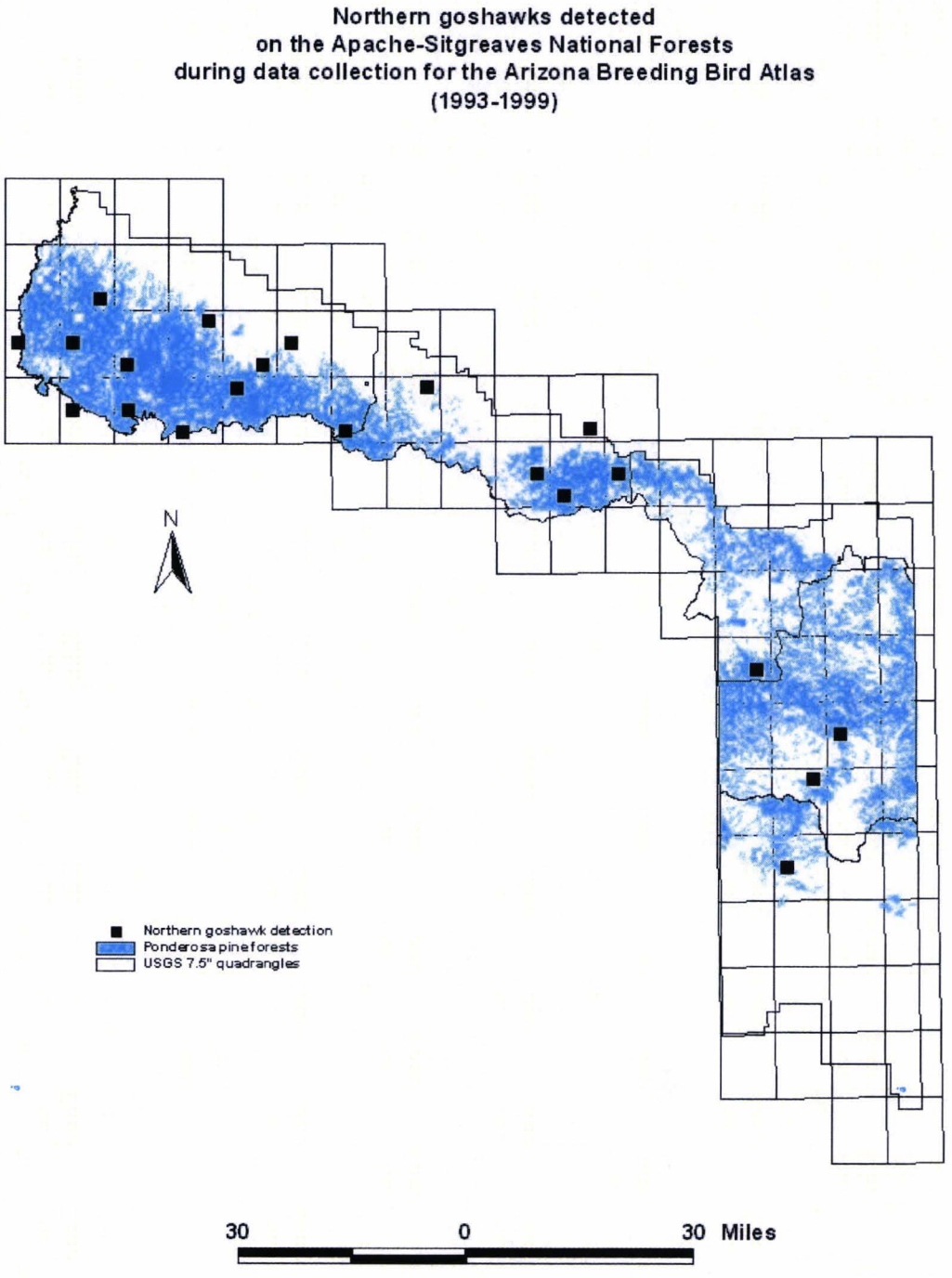


Figure 10. Distribution of goshawk detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of mid- and high-elevation coniferous forests.

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Pronghorn (*Antilocapra americana*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the pronghorn is an indicator species for early-succession habitat (USDA 1987a, p.134). More specifically, the plan (page 145 & 165) identifies antelope as management indicator species for Management Area, "Woodland", that includes pinyon-juniper with grassland understory, as well as, for Management Area, "Grasslands", that includes mountain grasslands, desert, and prairie grasslands. Pronghorn antelope are native to the prairies of North America. At one time they numbered in the millions and were found on the open plains from the Mississippi River to the Rocky Mountains and from Mexico to central Canada. With the European settlement of the plains, the population was reduced nearly to extinction. In Arizona, antelope are found primarily in the northern plains. They also inhabit high elevation meadows between forested areas, and scattered herds are found in the grasslands of southeastern Arizona (Arizona Game and Fish 2004).

Antelope are gregarious. They are found in mixed herds most of the year; except in the spring when the bucks are alone or in small groups. In the fall, bucks collect harems numbering up to 15 does, which they then defend from other bucks. Antelope breed in August and September and the young are born in May and June. The gestation period for the antelope is the longest for big-game animals in the United States. About eight months after mating, one or two fawns are born. The young are not spotted like the fawns of the deer family, but instead have markings similar to the adults. The fawns remain hidden, with the doe feeding them several times a day until they are strong enough to travel with the adults. Hence hiding cover for fawns is an important habitat feature.

In Arizona, pronghorn are primarily found in grasslands up to pinyon-juniper ecosystems, but also occur in meadows and grasslands adjacent to ponderosa pine, mixed-conifer, and spruce-fir forests in the high-elevation grasslands of the White Mountains (Hoffmeister 1986). The species is most abundant on shortgrass plains and meadows with scattered shrubs with rolling or dissected hills and mesas. Pronghorn are a species of concern with the Arizona Game and Fish Department because of statewide habitat losses and population declines.

On the Apache-Sitgreaves National Forests, pronghorn are found in herds inhabiting pinyon-juniper grasslands and transition habitats across much of the northern portion of the Forest, seasonally in the high-elevation grasslands of the White Mountains, and locally in grasslands along lower Eagle Creek (see Figures 1 and 2). Since the late-1980s, the Arizona Game and Fish Department has translocated pronghorn to two sites within the Forest, including the Eagle Creek area and an area east of Springerville (i.e. Sipes Ranch). Information provided by the Arizona Game and Fish Department shows about 291,346 acres of summer range and 188,521 acres of winter range for pronghorn on the Forest (see Figure 1 and 2).

Management Activities or Natural Events That May Affect Habitat

Negative: Overgrazing of grassland that reduces species composition and hiding cover for fawns; encroachment of trees into grasslands; fire suppression.

Positive: Timber harvest and firewood gathering in pinyon-juniper habitats that create openings and increase grass production; reduced livestock grazing; wildfires.

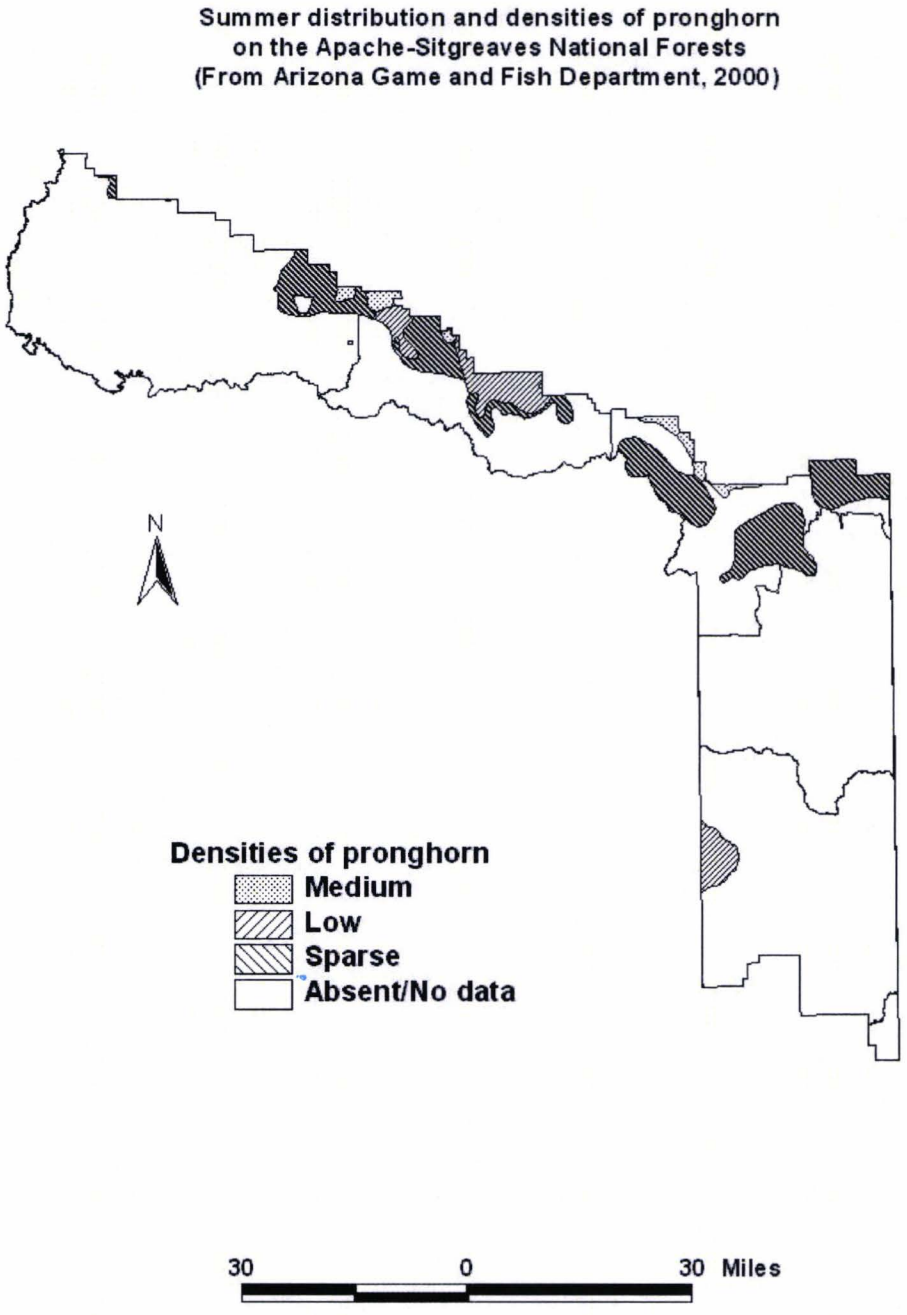

Figure 1. Summer distribution of pronghorn on the Apache-Sitgreaves National Forests.

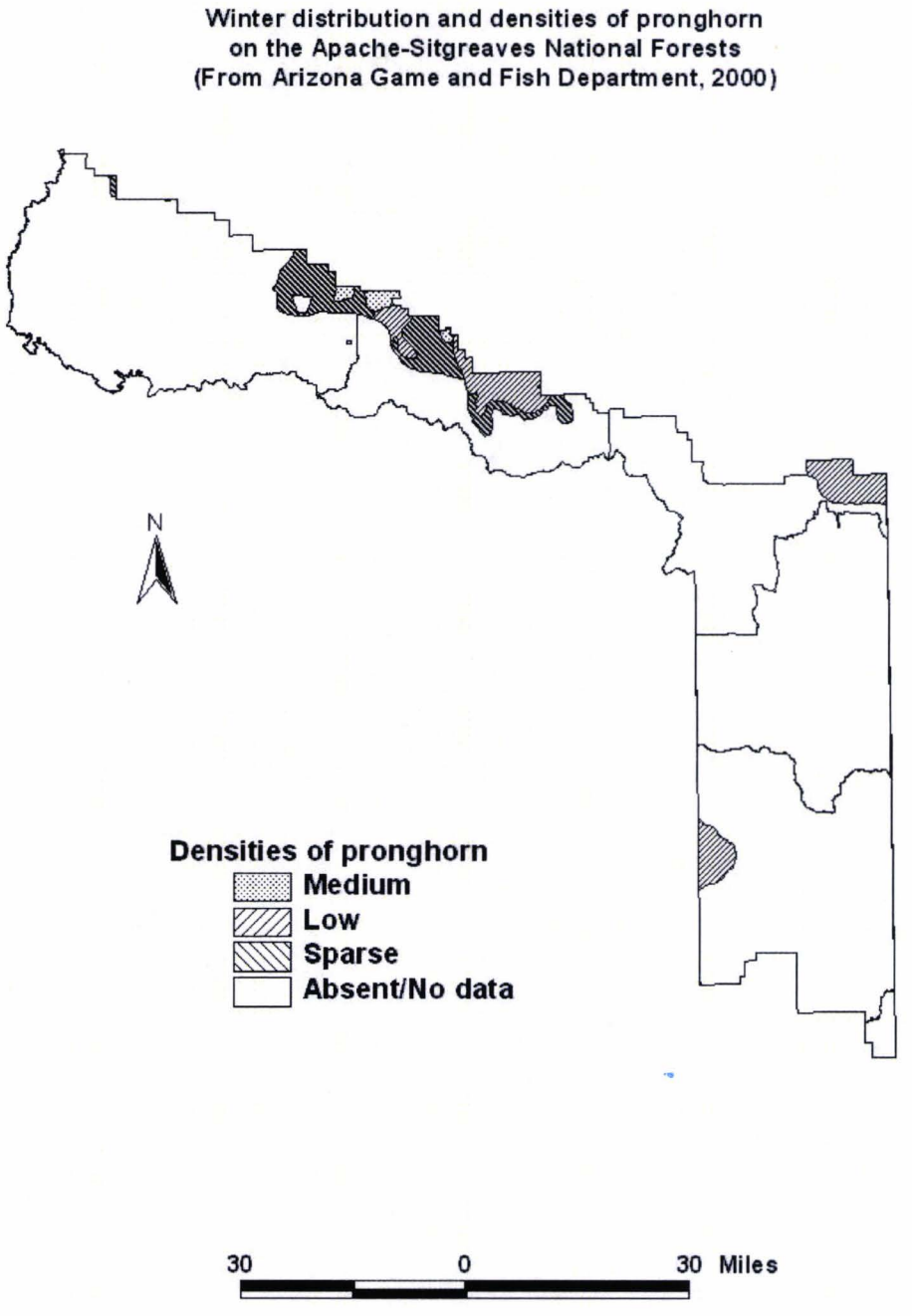

Figure 2. Winter distribution of pronghorn on the Apache-Sitgreaves National Forests.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), includes specific "Standards and Guidelines" that are expected to maintain or improve pronghorn habitat components in woodlands and grasslands including:

- Amendment 1 – Continue livestock grazing with increased emphasis on recreation, wildlife, and fishery resources, while maintaining basic soil and water values. The needs of wildlife will be considered when establishing livestock grazing capacity.
- Amendment 1 – Allotment management plans will recognize that domestic livestock may compete with big game animals (e.g. elk, deer, antelope) for available forage on some rangelands.
- Amendment 1 – On rangelands where available forage has been determined to be a limiting factor in achieving big game objectives, improved allotment management plans will be developed as described as above. Allow sufficient forage to accommodate wildlife, unless doing so would be inconsistent with multiple-use principles or with the Forest Plan. Big game habitat objectives are described in each management area and the Arizona Wildlife and Fisheries Comprehensive and Statewide Strategic Plans.
- Amendment 1 – Special considerations will be given to critical big game winter ranges in areas where big game winter range has been determined to be a limiting factor in achieving big game objectives. In those areas, no new year-round grazing or new winter grazing by domestic livestock will be allowed unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – New land acquisitions in these critical winter ranges will not be used for domestic livestock grazing unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – Total road densities should average 3.5 miles/square mile or less. Open road densities should average 2.0 miles/square mile or less.

MANAGEMENT AREA 2 - WOODLAND

- Maintain or improve big game habitat. Limit created openings on big game winter range to no wider than 1,200 feet. Leave cover strips at least 500 feet wide between openings; openings are not to exceed 40 acres. Maintain no less than the current level of openings on current antelope ranges. Emphasize openings adjacent to pine stringers.
- Manage areas that are harvested for fuelwood. Emphasize openings on existing and potential big game range. Retain thermal cover and hiding cover on north and east exposures. Manage fuelwood sales to break up large areas of single-age classes. Leave cavity excavated trees, shrubs, and oak in openings created for wildlife.
- Defer firewood activities from May 15 to June 30 in known fawning and calving areas.

- Manage for at least 20 percent of each diversity unit in thermal and hiding cover. Emphasize cover management in travelways, bedding areas, reproductive areas, and adjacent to key openings. Cover is managed to provide at least 60% crown cover and at least 500' wide.

MANAGEMENT AREA 4 – GRASSLANDS

- Evaluate need, maintain, and improve meadows by eliminating competing conifers, stabilizing gullies to restore water tables, and reseeding with species desirable to wildlife.
- Evaluate need and construct fences where necessary to protect key meadows from grazing.
- When springs are developed in meadow communities, riparian areas, or other sensitive areas, protect these areas by piping the water to water developments in adjacent, less sensitive areas.
- Maintain existing antelope range.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was early-succession habitat that included 243,126 acres of mountain grasslands, desert, and prairie grasslands and 611,025 acres of pinyon-juniper woodlands (USDA Forest Service 1987a, 1987b).

Based on the 1996 Forest Inventory Assessment (FIA) data set, the "Habitat Quality Index Model" (HQI, version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Apache-Sitgreaves National Forests for Pronghorn. The HQI model indicated that there were 244,781 acres of grasslands on the Forests (see Figure 3). The Habitat Quality Index (HQI) model outputs indicate both forage and cover habitats on the Forest are at about 50% of their capability. However, the HQI model does not rigorously assess grassland conditions.

The 1996 FIA data indicates that there are 740,710 acres of pinyon-juniper woodlands. While this may appear to be an increase in this habitat type over the 1986 information described in the Forest Plan, some of the increase may simply be due to a difference in data collection methods. However, some of the increase may also be due to encroachment of pinyon-juniper into grasslands. In that case, the habitat type is still considered suitable pronghorn habitat.

The Forest Plan EIS shows a total of 145,428 acres of timber in age class 1-40 years old (USDA Forest Service 1987b, p. 150). This age group represents non-stocked stands (VSS1) and seedling/sapling stands (VSS2). In addition, there were 252,660 acres of mountain and prairie grasslands. Combined, these habitat types totaled 19.8% of the Apache-Sitgreaves NF. In 1996, based on FIA data there were about 244,781 acres of grasslands and 138,786 acres of non-stocked and seedling/sapling stands, or about 19% of the Forest. These figures are displayed in Figure 4.

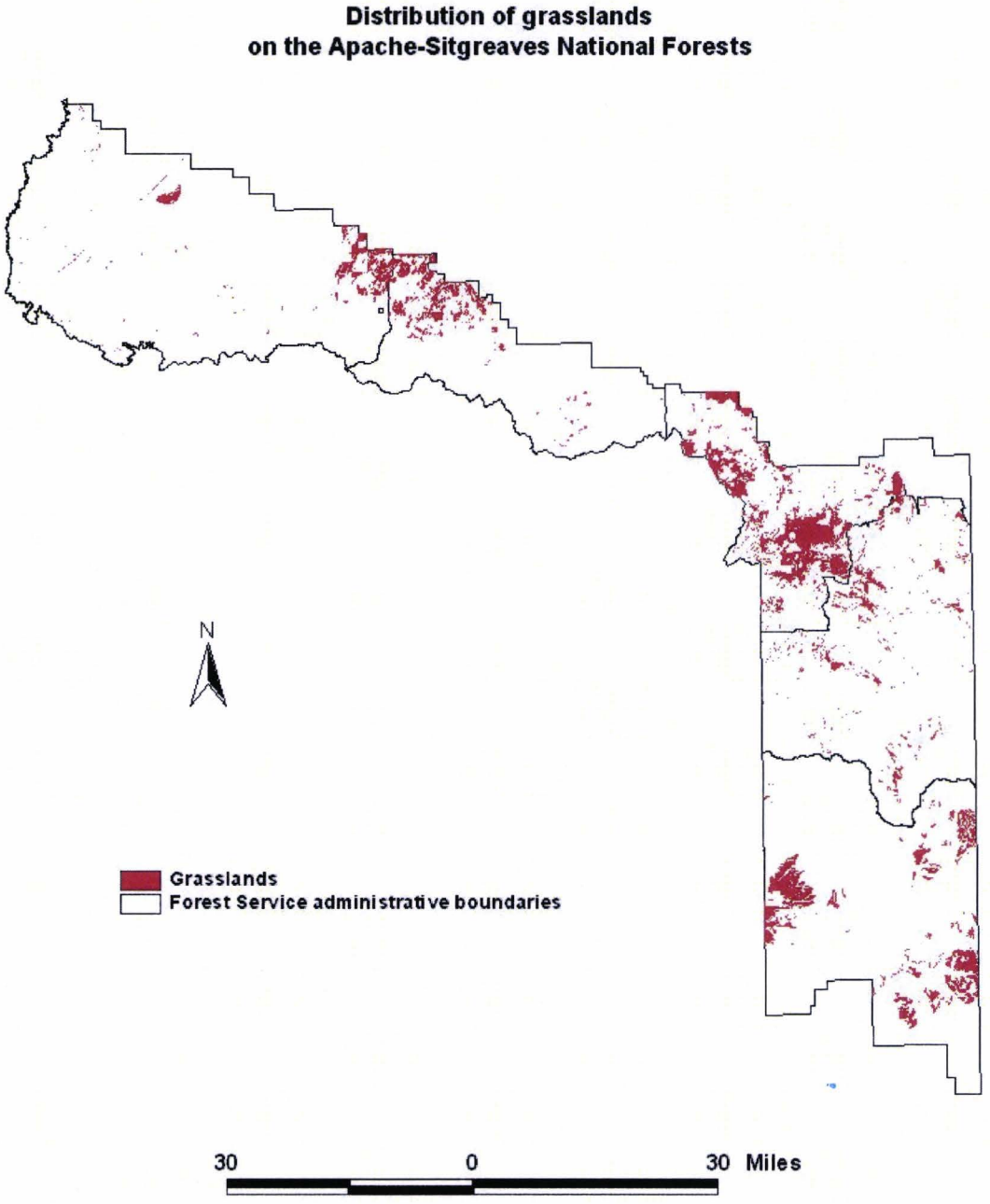

Figure 3. Distribution of grassland habitats in the Apache-Sitgreaves NF.

Both wildfire and timber harvest can also affect the amount of early-succession habitat. Timber harvest, especially clearcuts, can create early-succession habitat. However, clearcuts were never a very large percentage of the timber harvest program in the Apache-Sitgreaves NF. Since 1985, clearcuts constituted less than 1% of the timber treatments in the Forest (Beal 2005). Therefore, it is unlikely that declines in the timber harvest program will have any effect on the availability or trend of early-succession habitat across the Forest.

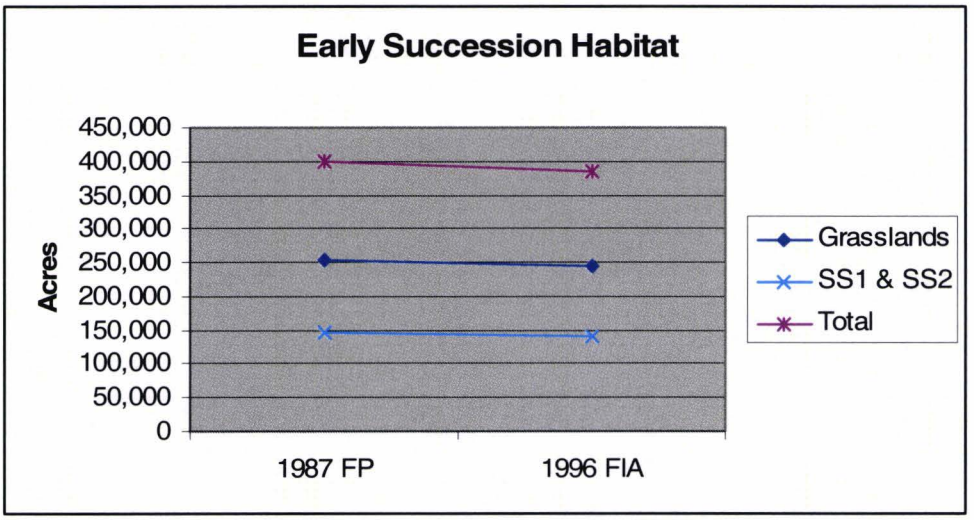

Figure 4. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-1996).

Wildfire has much greater potential to create early-succession habitat. Such was the case with the Rodeo-Chediski fire of 2002. The fire burned over 173,000 acres including about 20,810 acres of pinyon-juniper woodlands, converting 55% of that area back to early-succession habitat (USDA Forest Service 2003b). Figure 5 shows the changes to early-succession habitat in the Forest by 2004 due to the Rodeo-Chediski fire.

Early-succession habitat is by definition a transitory state except in grassland communities. Nonstocked stands and seedling/sapling areas eventually grow back into forested stands. The vast majority of the early-succession stands in the forest are in ponderosa pine, pinyon-juniper and juniper habitat types. As displayed in Figure 2, these habitat types show large net growths indicating that early-succession areas have the potential to quickly grow into later succession stages. However, the early-succession habitat created by the Rodeo-Chediski fire may be an exception. Many of the burned areas are very large and are not expected to become reestablished with trees for many years, possibly even centuries (USDA Forest Service 2003b). These areas may persist as early-succession habitat for a very long time.

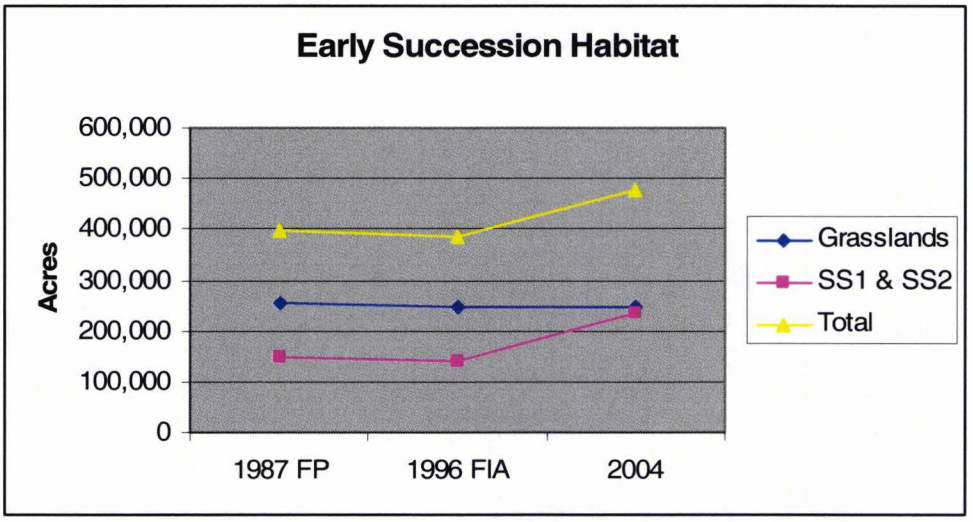

Figure 5. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-2004).

Grasslands are another component of early-succession habitat, especially with regard to antelope. The amount of grasslands habitat in the Forest has remained stable over the life of the plan (see Figure 5). The condition of these grasslands is well described in White 2003. Generally speaking, all of the grasslands have been adversely impacted by livestock grazing dating from the late 1800s. Many of the grasslands were originally dominated by native cool-season bunchgrasses that are not tolerant of grazing. Prior to the arrival of the livestock industry, the only large animals to graze these grasslands were pronghorn antelope. It took only 10-15 years of heavy grazing by cattle near the end of the last century to extensively alter these ecosystems (White 2003). As a result, most of the grasslands in the Forest are in poor ecological condition due to loss of native grasses, reduced plant diversity, decreased litter cover, and increased soil erosion. While the Forest has regularly decreased the numbers of permitted livestock, a burgeoning elk herd has replaced cattle with similar adverse effects. Thus, the ecological trend in the grasslands has been stable but the grasslands are still in poor condition.

Based on the information currently available **there appears to be an upward trend in the amount of early-succession habitat** due primarily to the effects of wildfire. **The trend in the quality of early-succession habitat appears to be stable but grasslands are generally in poor condition** and well below potential. The amount of pinyon-juniper habitat also appears stable. The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

POPULATION TREND

The pronghorn (*Antilocapra amernicana*) is a wide-ranging species in North America (see Figure 6) (Natureserve 2005). Throughout its range, the species is considered

secure (Heritage Global Status: G5; National Status Rank: N5; Arizona Status Rank: S5) (NatureServe Explorer 2005). Figure 6 displays the distribution of the species across its range.

Arizona

Once second only to deer as a game animal, Arizona's antelope were first given a closed season in 1893. The response must have been less than satisfactory, however, as the season was completely closed in 1905. By 1922, the state's antelope population was estimated to be less than 1,000 animals.

Then, for reasons that still are not fully understood, pronghorn antelope began to make a comeback. Aided by a closed season, government predator control programs, and the abandonment of numerous homesteads, pronghorn numbers steadily increased until fears were expressed that some northern Arizona populations were in danger of exceeding their food supply. Accordingly, a limited hunt of 400 buck permits was authorized for northern Arizona in 1941.

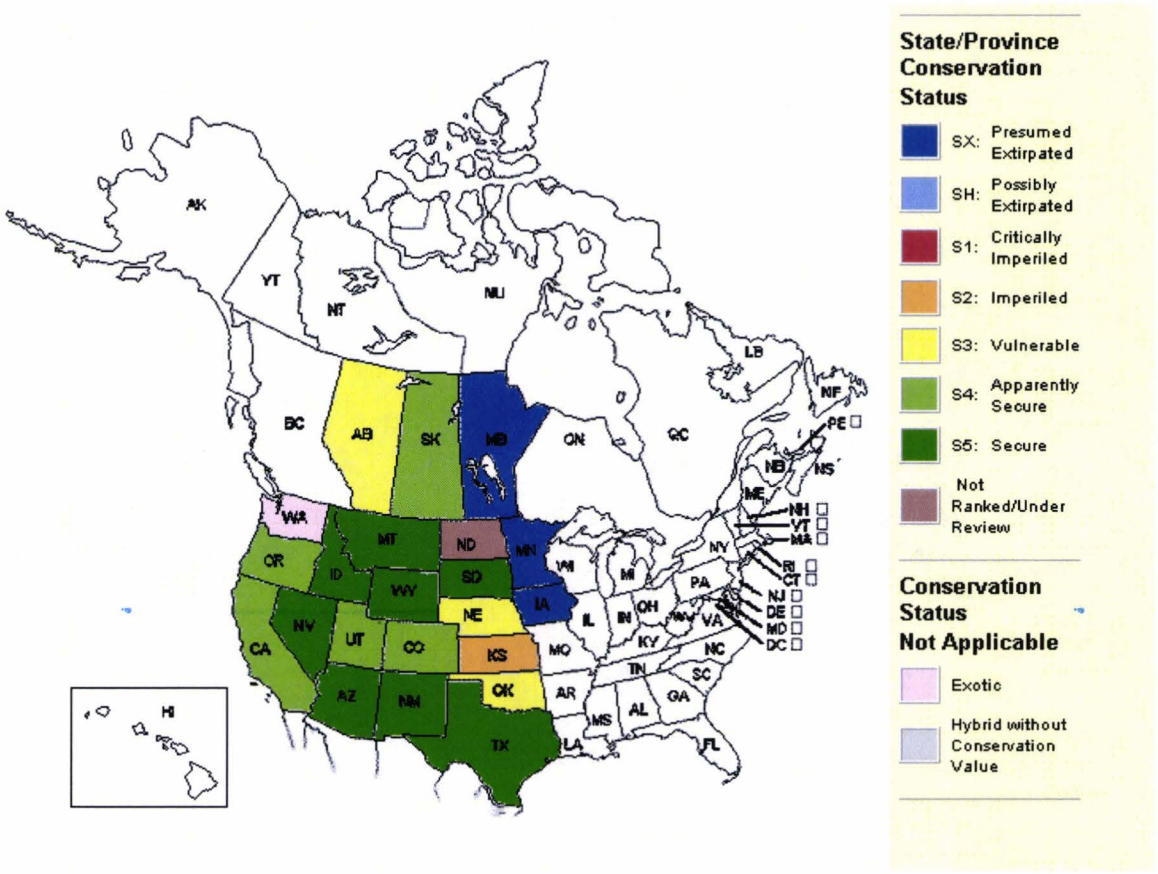

Figure 6. Distribution map of pronghorn in North America displaying conservation status by state (Natureserve 2005).

After a closed season from 1944 to 1948, antelope hunting in Arizona recommenced in 1949. Hunts were liberalized gradually, until 1954 when 1,600 permits were issued and 1,146 bucks were taken. Despite the issuance of a number of antlerless antelope permits between 1961 and 1975, this level of harvest has never again been equaled. Annual harvests since 1990 have varied between 500 and 700 bucks, with archers taking a proportionally larger percent of the harvest in recent years. Plagued by encroaching subdivisions, increasing highway construction, and other land-use changes, maintaining even the present number of antelope is dependent on citizen involvement and an aggressive translocation program. Approximately 10 percent of the 1998 antelope harvest was in areas having reintroduced herds (Arizona Game & Fish, 2004).

Apache-Sitgreaves National Forest

The pronghorn is considered a fairly common, permanent resident of the Apache-Sitgreaves NF. Arizona Game and Fish Department manages the state's pronghorn population through annual hunting permits issued for each hunt unit. Antelope hunt units that are wholly or partially located within the Forests are Units 01, 03A, 03B, 03C, 04A, 04B, and 27. Harvest data and survey data for these units are displayed in Figures 7 and 8 below. Based on the harvest and survey data the following population objectives were determined by AG&F personnel for each hunt unit.

1990 – 2000 Adult Pronghorn Antelope Population Analysis
Unit 1 – Adult population fairly stable. 10% decline in fawns probably due to drought effects. Recent decline in entire population reflects recent decline in fawn recruitment.
Unit 3B – Fawn recruitment on Forest is lower than it is on private and state lands to the north, possibly due to pinyon-juniper encroachment and increased predation.
Unit 3C – Population stable over last 10 years – AGFD closed hunt for 3 years (98-00)
Unit 4A – Not a concern because population too small on Forest.
Unit 4B – Population is fluctuating (early 90's decline; now a slight up trend). Drought influence on fawn recruitment.
Unit 27 – Population is stable.

According to Cagle (pers. com., 2002) the continued presence of a reproductive population of pronghorn on the Forest is likely. Concerns for pronghorn on the Forest include:

- Short-term - Continued drought could significantly decrease population
- Long-term – Pinyon-juniper encroachment in some areas may degrade habitat quality. Developments on lands adjacent to forest impacting antelope habitat, increasing the importance of habitats on the Forest.

Based on Arizona Game and Fish Department evaluations, the population of reproducing pronghorn on the Apache-Sitgreaves National Forest appears to have been fairly stable over the last decade and apparently is within population goals identified in the 1990 Comprehensive Plan (Arizona Game and Fish 1990). At least low densities of the species appear to be well dispersed in suitable habitats on the Forest. Habitat for pronghorn appears to be capable of continuing to support a reproducing population of the species that is well distributed in suitable habitat on the Forest.

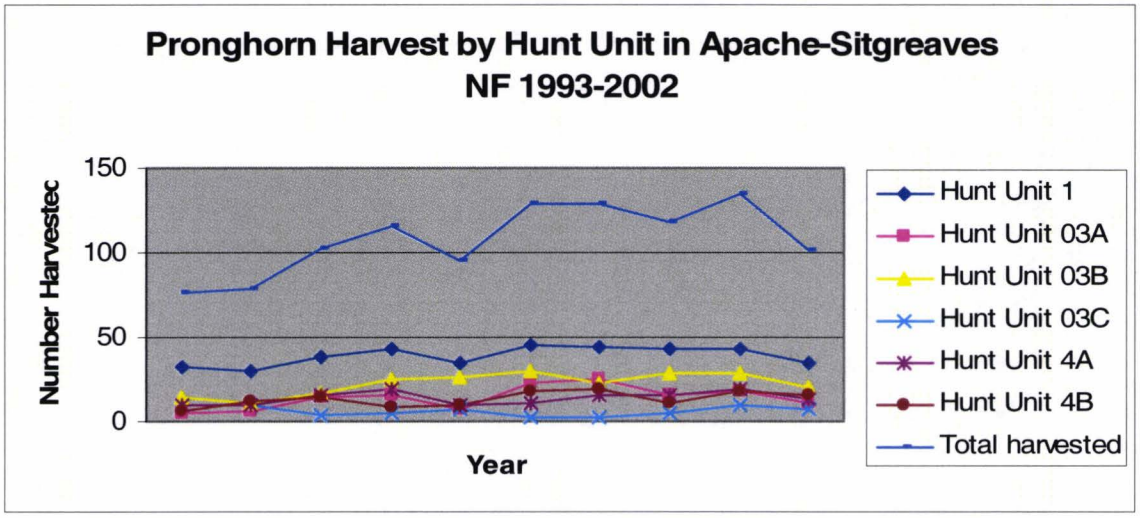

Figure 7. Pronghorn harvest data from Arizona Game and Fish 2004.

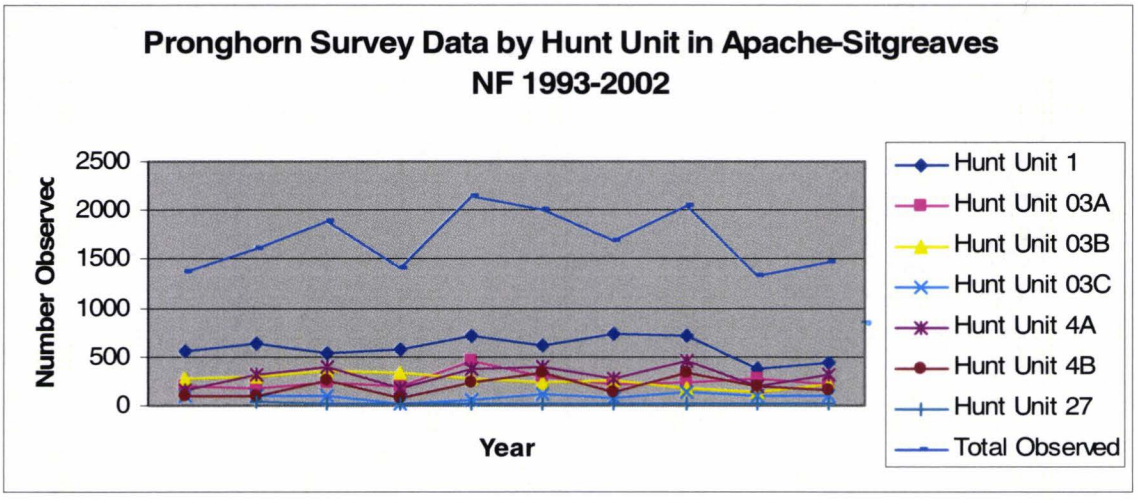

Figure 8. Pronghorn survey data from Arizona Game and Fish (2004) on the Apache-Sitgreaves NF.

Taking into account the continuing occurrence of the pronghorn across the Forest in suitable habitat, the abundance and wide distribution of suitable habitats across the Forest, upward habitat trends for early succession habitat in the Forest, and the presence of a harvestable surplus in the pronghorn population, it appears that the Forest supports a well distributed reproducing population of this species. **Currently, pronghorn**

populations in the Apache-Sitgreaves National Forest are considered to be stable, and likely near potential.

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Pygmy nuthatch (Sitta pygmaea)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves NF, the pygmy nuthatch is a management indicator species for late succession. Although the Forest Plan (USDA Forest Service 1987b) did not specify any habitat type, certain statements indicate the pygmy nuthatch was selected as a management indicator species to represent snags in mature or "old growth" ponderosa pine. The pygmy nuthatch (*Sitta pygmaea*) is a nonmigratory, primary cavity-nesting bird typically associated with ponderosa pine forests of western North America (NatureServe 2001, DeGraaf et al. 1991). In Arizona, the species is an abundant resident in ponderosa pine forests, and to some extent in adjacent nearby pinyon-juniper woodlands (Phillips, Marshall, and Monson 1964, Monson and Phillips 1981).

As a primary cavity-nesting species, pygmy nuthatches usually excavate nest cavities near the top of dead pine trees where the wood is well rotted. Occasionally, aspen snags are used. As a secondary cavity nester, the species relies on cavities already excavated in dead or live trees by other birds such as woodpeckers. Cavities also provide important thermal cover for the gregarious bird during winter (W. Sydeman, pers. com.). At night, these birds may roost in groups in tree cavities. The species primarily feeds on insects on pine trees, and also consumes conifer seeds (DeGraaf et al. 1991).

Management Activities or Natural Events That May Affect Habitat

Negative: Excessive gathering of dead and down fuelwood, reducing fuel loads by prescribed fire and wildfire across large areas. Timber harvest that converts mature and late-succession stands to earlier succession.

Positive: Maintaining large trees for future down logs and snags, maintaining standing, dead aspen trees, reducing open-road densities in areas of highly accessible dead and down material, low-intensity wildfires, and insect and disease infestations.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (USDA Forest Serviced 1987a), includes specific "Standards and Guidelines" that are expcted to maintain or improve snag habitat and mature forests in Management Area 1 (p. 122) including:

- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement p. 122-2).
- Minimum criteria used to determine old growth include 1 snag/acre in ponderosa pine, 2.5 snags/acre in mixed-conifer, and 3 to 4 snags/acre in spruce-fir. No minimum criteria are identified for identifying aspen old growth (p. 122-2).
- Implementing the Forest snag policy, providing at least 55% of a diversity unit with at least 180 snags per 100 acres. In high-priority areas, including both edge habitats adjacent to meadows or water, manage for an average of 280 snags per 100 acres. Only ponderosa pine/mixed-conifer species will be counted toward meeting minimum snag requirements (p. 122-3).

The amended Forest Plan also includes specific management objectives related to snags and larger trees for northern goshawks and Mexican spotted owls (pp. 70 to 70-16). This direction

was implemented to bring forest plans into compliance with the Mexican Spotted Owl Recovery Plan (USFWS 1995) and to "safeguard the viability of northern goshawk" (USDA Forest Service 1996), but also addressed the habitats for which pygmy nuthatches were selected to represent as a management indicator species. Specifically, these guidelines direct the management of vegetation to:

- Leave at least 2 snags/acre in ponderosa pine forests
- Leave at least 3 snags/acre in mixed-conifer forests
- Leave at least 3 snags/acre in spruce-fir forests

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was late succession. However, two levels need to be considered when looking at pygmy nuthatch habitat across the Forest. First is the overall ponderosa pine habitat type. The 1996 FIA data (USDA Forest Service 2003a) estimated a total of about 752,013 acres of ponderosa pine. This generally agrees with information from the Forests' geographic information system (GIS) layer (USDA Forest Service 2005), which shows an estimated 746,902 acres of ponderosa pine in the Apache-Sitgreaves National Forests. Based on the FIA data set and coefficients, the model recognized 569,890 acres of year-round habitat that provide some value for foraging by the species. Among these "foraging acres", the model recognized 531,908 acres of year-round habitat that provide some cover value for the species. The habitat quality index (HQI) generated by this model indicates that the Forest, as of 1996, provided overall habitat capability at about 40% of its potential for pygmy nuthatches.

Since the FIA data was collected, both timber harvest and wildfires have affected ponderosa pine forests. Total annual timber harvest history in the Forest is shown in Figure 1. However, not all timber harvest adversely affects habitat for the pygmy nuthatch. Records of harvest levels for the forest (Beal 2005) indicate that there have been 1,890 acres of timber harvests that removed large-diameter trees (seed cuts, clearcuts, and overstory removals) since 1996 for an average of about 371 acres per year. At the same time, trees are growing in the rest of the Forest and habitat conditions there are gradually improving. Because of this, it is not likely that the habitat capability for pygmy nuthatches has been reduced since 1996. See Appendix A for more discussion of forest growth.

Wildfires have also affected mature and late-succession forests, especially the Rodeo-Chediski fire. Since 1985, acreage burned in the Apache-Sitgreaves National Forests from wildfires totaled less than 2,000 acres per year for 11 years out of 18 (Figure 2). From 1985 to 1996, wildfires impacted about 5,356 acres each year in the Forests. From 1997 to 2001 (after FIA data collection), an average of 1,477 acres each year have been impacted to some extent by wildfires in the Forests. Information is not available summarizing cover types impacted by these fires, or the acreage actually impacted by "high-intensity" conflagrations. However, it is likely that high-intensity fires impacted only a small percentage of these acres (J. Thompson, pers. comm.). Likewise, not all of the acres impacted by high-intensity fires were in habitats important for pygmy nuthatches. Given the wide distribution of pygmy nuthatches across the Forests (Figure 7), the continued recurrence of wildfires, as observed from 1985 to 2001, is not likely to significantly reduce or fragment the distribution of pygmy nuthatches in the Forests. In addition, this type of fire regime is also not likely to reduce the overall habitat capability for pygmy nuthatches to levels where the Forests are no longer able to provide habitat to sustain a reproducing population of the species.

Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

Figure 1. Annual timber treatments in the Apache-Sitgreaves NF (1985-2006).

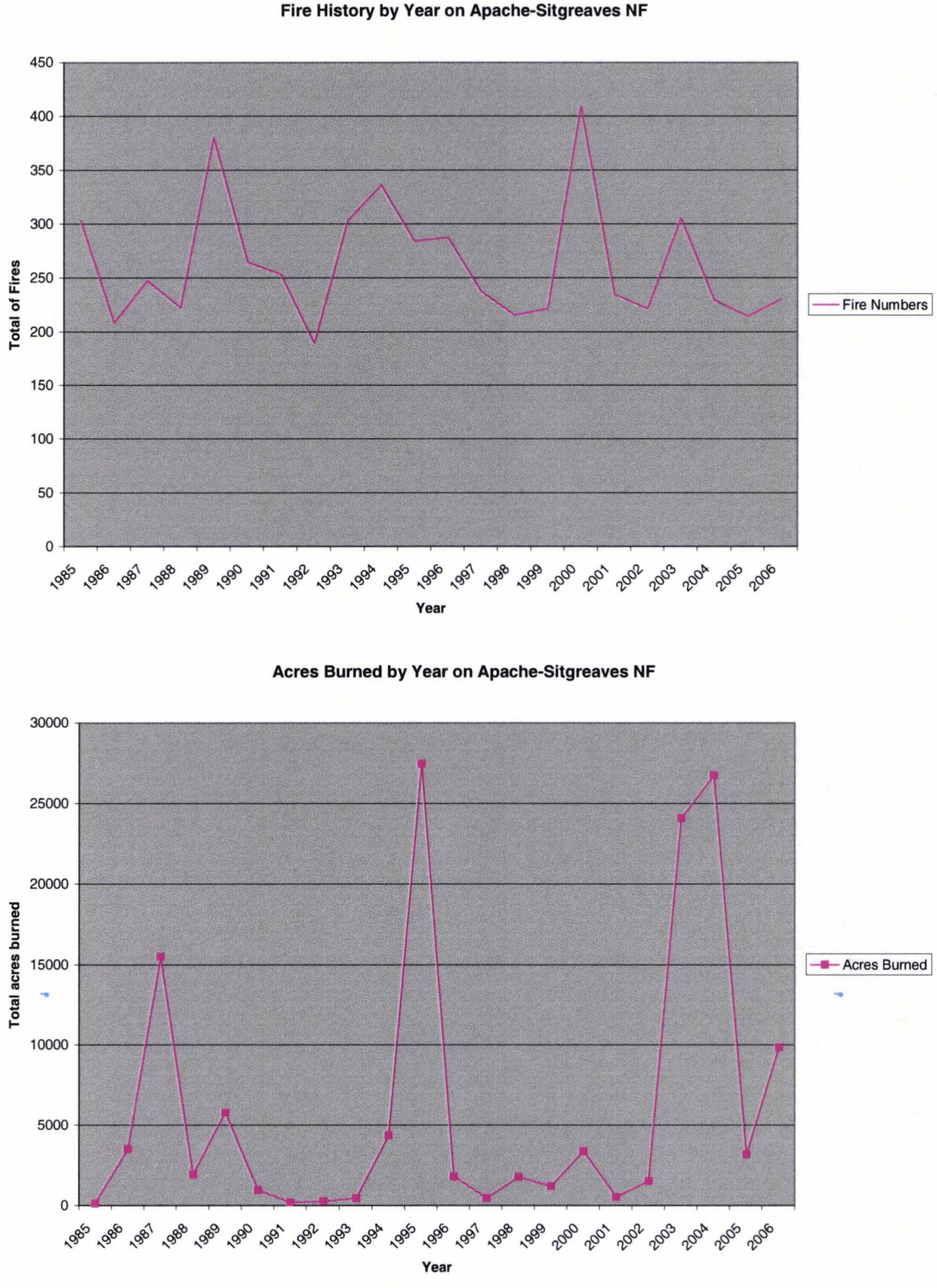

Figure 2. Summary of fires and acres burned annually by wildfire and prescribed burn in the Apache-Sitgreaves NF (1985-2006). Actual figure in 2002 was 173,000 acres due to the Rodeo-Chediski fire.

Catastrophic fires, such at the Rodeo-Chediski wildfires of 2002, may cause landscape-wide modifications to the habitat capability of the Forests for pygmy nuthatches. During the Rodeo-Chediski fires, a total of about 18,960 acres of mid-aged, mature, and late-succession forests burned at high or moderate severity, reducing or eliminating the forests' value to pygmy nuthatches. However, increases in snag density in proximity to lightly burned or unburned stands within the fire perimeter likely increases the habitat value of those stands. The Rodeo-Chediski Fire Salvage analysis indicated that habitat capability for pygmy nuthatches did not change substantially due to the fire (USDA Forest Service 2003b). Surveys conducted in burned forests in the Apache-Sitgreaves NF indicate that pygmy nuthatches were the second most common species recorded in December 2002 following the Rodeo-Chediski fire (Covert unpub. data).

The second level of habitat that needs to be considered in assessing Forestwide habitat trend for the pygmy nuthatch is the abundance of dead and down wood. Pygmy nuthatches use snags for both nesting and foraging, and use down logs for foraging. The 1996 FIA for the Apache-Sitgreaves NF estimated there were about 44 million standing dead trees (snags) greater than 1 inch in diameter, averaging 25 snags per acre. Over half of the snags occurred in the ponderosa pine habitat type. However, not all of these snags have much value for wildlife. About 24% of these snags were between 5 and 10.9 inches in diameter. These snags provided foraging habitat for many species of insectivorous birds. However, most cavity-nesting birds prefer even larger diameter snags for nesting purposes. The FIA data indicates that there were about 3.5 snags per acre that are 11 inches in diameter or greater at the time of the inventory and 1.4 snags per acre that are 17 inches or greater. About 40% of these large snags were found in ponderosa pine. However, these snags probably were not evenly distributed across the landscape. There were about 8.1 aspen snags per acre greater than 12" diameter available in aspen stands with other large-diameter aspen snags scattered in other forest types (e.g. Douglas-fir and white fir).

Snags are not long lived. Snag fall-down rates vary by species, diameter, and cause of mortality. Snag fall-down rates for the Apache-Sitgreaves NF have not been estimated but fall-down rates for other forests with similar habitat types indicate that most ponderosa snags persist for 2-20 years (Bull et al. 1997). Thus, the persistence of snags across the landscape is dependent on continuing tree mortality. Mortality in the Apache-Sitgreaves NF was estimated based on 1996 FIA data (USDA Forest Service 2003a) at about 13% of gross annual growth. Forty-five percent of this mortality was caused by disease, 28% by fire, and 15% by insects. The remaining 12% was attributed to weather, suppression, and animal damage, in respective order of prominence.

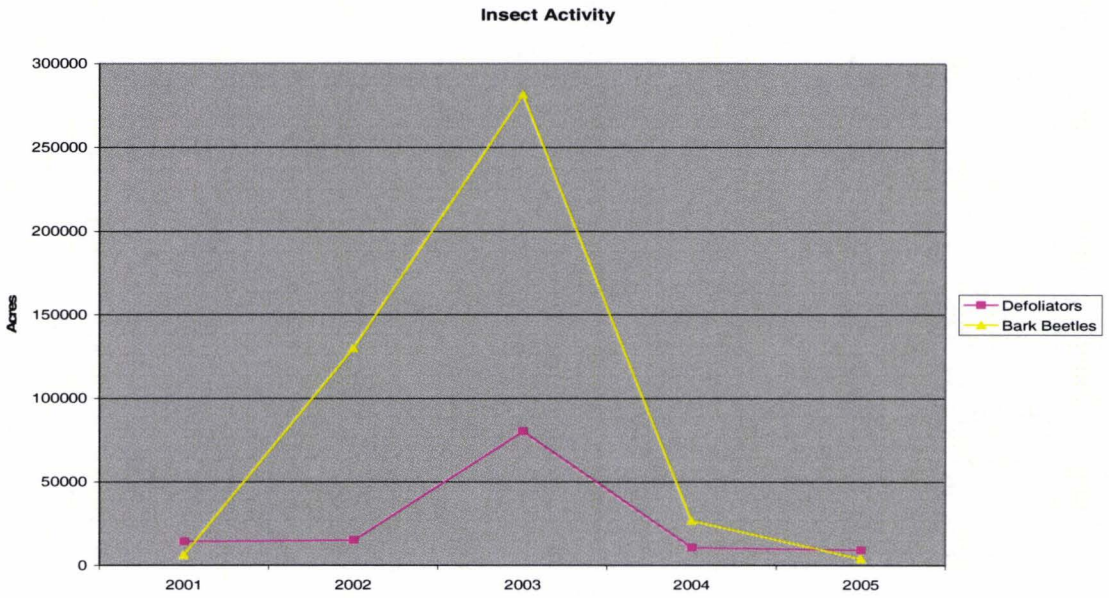

Figure 3. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2005).

Snags continue to be created by insects and disease in the Forest. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 3. Infestations vary widely from year to year but continue to be present in the Forest, creating pockets or larger areas of new snags.

Fire also continues to create snags in the Forest. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 2. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771.

The Rodeo-Chediski fire created large numbers of snags in the burned area. Prior to the fire, large snags (≥18" DBH) numbered about 0.4 snags per acre in ponderosa pine habitats and about 1.2 snags per acre in mixed-conifer habitats (USDA Forest Service 2003b). No aspen stands were burned in the fire. After the fire, large snags averaged 7.6 snags per acre across the burned area. There are still pockets of low-severity burned and unburned stands with low snag numbers. Snag densities in these areas are increasing due to increased insect activity (USDA Forest Service 2003b). Snags are expected to fall over in the next 2-20 years depending on tree species and size. No additional recruitment of snags is expected for at least 75 years in areas of moderate and high-severity burn.

The ROD and EIS for the Rodeo-Chediski Fire Salvage project authorized salvage of fire-killed trees on about 34,000 acres of the burned area. Trees to be removed are greater than 12" DBH. Two snags per acre were prescribed to be left in all salvage units. This project was expected to result in an average of 6.3-6.8 large snags remaining across the burned landscape after treatment (USDA Forest Service 2003b).

Based on the information, available **habitat quality for the pygmy nuthatch is fair with an upward trend** due to increases in snags, ongoing forest growth, and declining timber harvest.

However, **conditions are likely still below potential.** For more information on habitat trend in late-succession and snag habitats, see Appendix A.

POPULATION TREND

Pygmy nuthatches are year-round residents of pine forests and woodlands, especially ponderosa pine, and less frequently pinyon-juniper (NatureServe 2005). Overall, the US pygmy nuthatch population is stable (-0.09, p=.90932) (Sauer et al. 2004).

The pygmy nuthatch is a widely distributed resident across North America (Figure 4), occurring from southern interior British Columbia south in mountains to central Mexico (Natureserve 2005).

The Global Heritage State rank for pygmy nuthatch is G5 (i.e. globally secure and common, widespread, and abundant) across its range. It has a large range and is common in many areas; although there are conservation concerns in some states (Figure 4). In the United States, pygmy nuthatch populations are ranked N5 (secure). The Arizona Heritage status for the pygmy nuthatch is S5 (i.e., secure, common, widespread, and abundant; Nature Serve Explorer 2005).

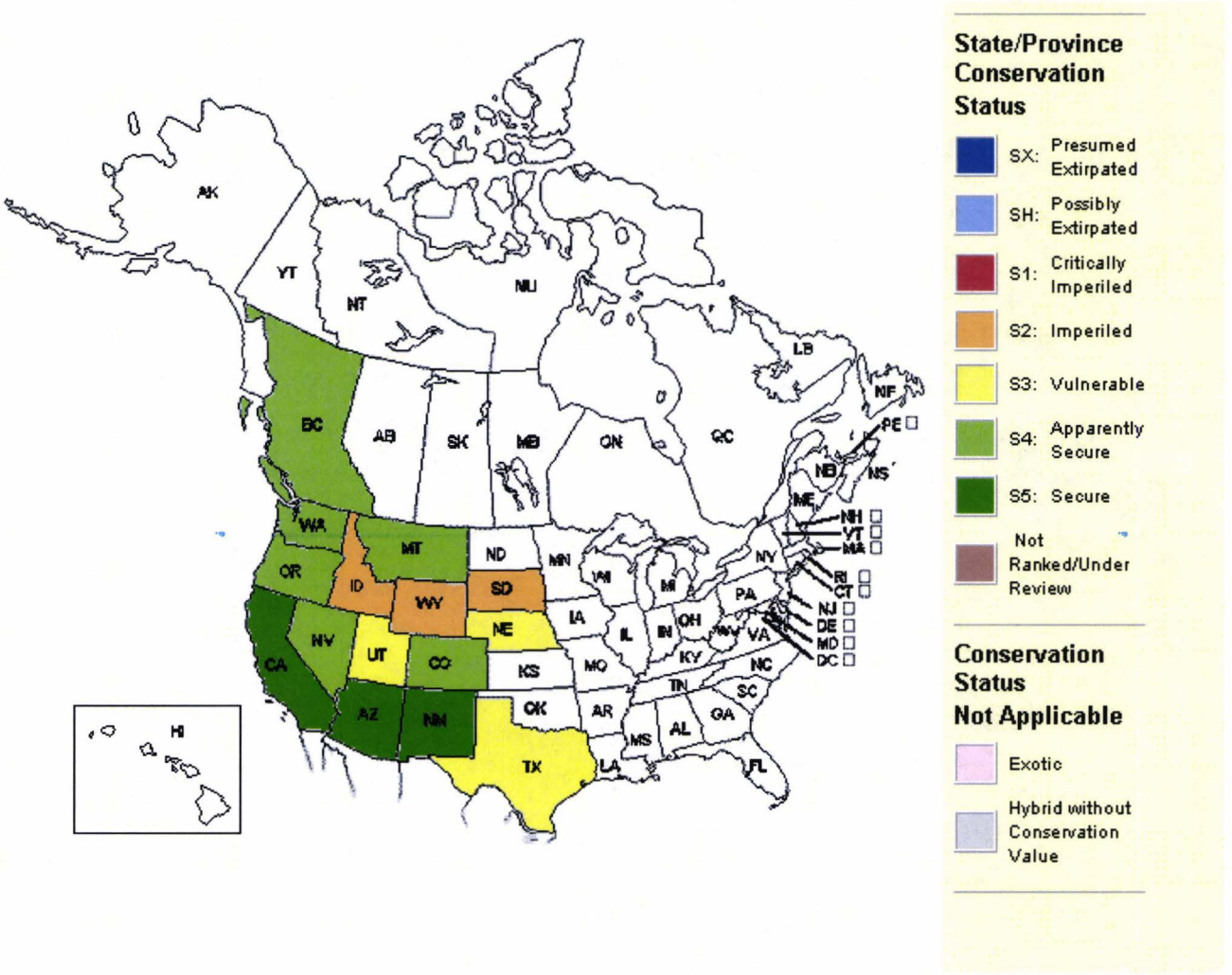

Figure 4. Distribution map of the pygmy nuthatch in North America displaying conservation status by State.

Arizona

The pygmy nuthatch is considered a common to fairly common resident of both the Apache-Sitgreaves NF and the adjacent Gila NF in New Mexico (USDA Forest Service 1996; USDA Forest Service 1997).

Monitoring information from the North American Breeding Bird Surveys in Arizona indicates that pygmy nuthatch populations and trend are stable and abundant. Summaries of BBS data for Arizona (Sauer et al. 2004) for pygmy nuthatch show a nonsignificant (p = 0.74255), negative trend of 0.86% between 1966 and 2003 (Figure 5). From 1980 to 2003, there has been a nonsignificant (p = 0.73692) negative trend of 0.94%. This trend estimate is a summary of the population change over the last 37 years, and does not provide information on other patterns of population change (such as cycles) over time. Fifteen survey routes[1] were used in this analysis, and the relative abundance of pygmy nuthatches observed per route was 5.05. These results corroborate the stable trend seen in the nationwide data shown in Figure 5.

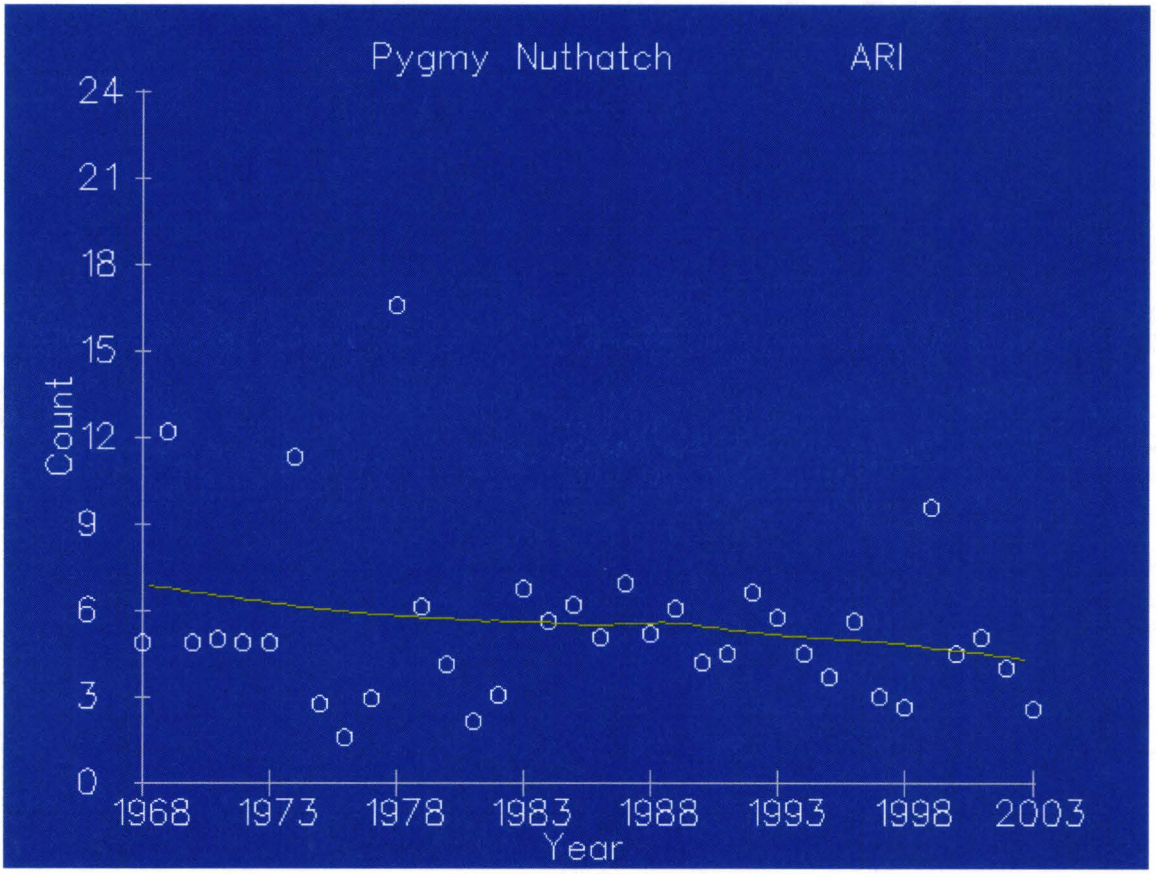

Figure 5. Estimated population trend for pygmy nuthatch in Arizona (Sauer et al. 2004)

[1] Numbers reflect the abundance of the species near the survey route. They are averages of the total counts along the route for the period 1989-1998. Because each survey route is 24.5 mi long, and consists of 50, 3-minute counts along the length of the route, the abundance estimate represents the number of birds that a very good birder would encounter in about 2.5 hours of roadside birding in the area near the BBS route (Sauer et al. 2004).

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The pygmy nuthatch was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). Arizona PIF also identified statewide population objectives for the pygmy nuthatch: "Maintain the current statewide population of 710,000 individuals." The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort also did not identify the pygmy nuthatch as a species of concern in this region.

Apache-Sitgreaves National Forest

The Arizona Game and Fish Department (Arizona Game and Fish, unpub. data) surveyed a portion (i.e. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Of these, 65 sectors occurred on ASNF lands. Breeding Pygmy Nuthatches were detected, from 1993 to 2000, at least once in 45 of these sectors distributed across the forest (Figure 6).

A summary of habitat associated with each sighting may indicate the species is not as restricted to ponderosa pine forests as previously assumed. Habitats dominated by ponderosa pine accounted for about 39% of all habitat associations recorded during the ABBA surveys where breeding pygmy nuthatches were detected in the Forests. Breeding individuals of the species were also found associated with mixed-conifer forests about 33% of the time. Other forest types (pinyon-juniper, riparian, aspen, spruce-fir) were associated with the species at about 28% of the sites. Mixed-conifer forests (and other forest types, collectively) appear to provide significant habitats for pygmy nuthatches in the Forests.

Five Breeding Bird Survey routes are located in the Forest. Most of these routes have been surveyed annually since 1992. Pygmy nuthatches were detected on four of the five routes, being absent on only the "Clay Springs" route (Table 1). Most of the route traverses through pinyon-juniper woodlands and areas transitioning between woodlands and ponderosa pine. This trend information should be interpreted with caution due to very small sample sizes on each route (Sauer et al. 2004). These trends should not be considered significant. However, the information for each route is relevant to documenting the general distribution and persistence of the species in the Forests.

Table 1. Breeding bird survey trend estimates for pygmy nuthatch

BBS Route	Trend Estimate	P value	Number of Years	Average Count Per Route/Year
Sprucedale	-30.72	0.00013	11	6.82
Forest Lakes	-12.76	0.21205	10	5.90
Alpine	-34.15	0.00078	6	3.67
Clay Spring	N/A			
Pinetop	-13.98	0.70670	5	6.80

Recent MIS monitoring efforts in the Black Mesa Ranger District (unpublished data) conducted from 2001-2005 support the status of the pygmy nuthatch as a relatively common species in the Forest. Pygmy nuthatches (n=43, 0, 14, 83, 58) were seen in riparian areas and ponderosa pine stands and were one of the more common species recorded. Pygmy nuthatch observations

increased noticeably from 2003 to 2004 in areas of high burn severity in the Rodeo-Chediski fire.

Taking into account the continuing occurrence of pygmy nuthatches across the Forest in a wider range of habitats than expected, stable habitat trends for pine and snag habitat in the Forest, and the overall population trend across Arizona, it appears that the Forest supports a well distributed reproducing population of this species. **Currently, pygmy nuthatch populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely lower than potential.** Continued implementation of conservation measures to maintain late-succession habitats and snags should continue to improve pygmy nuthatch habitat and populations.

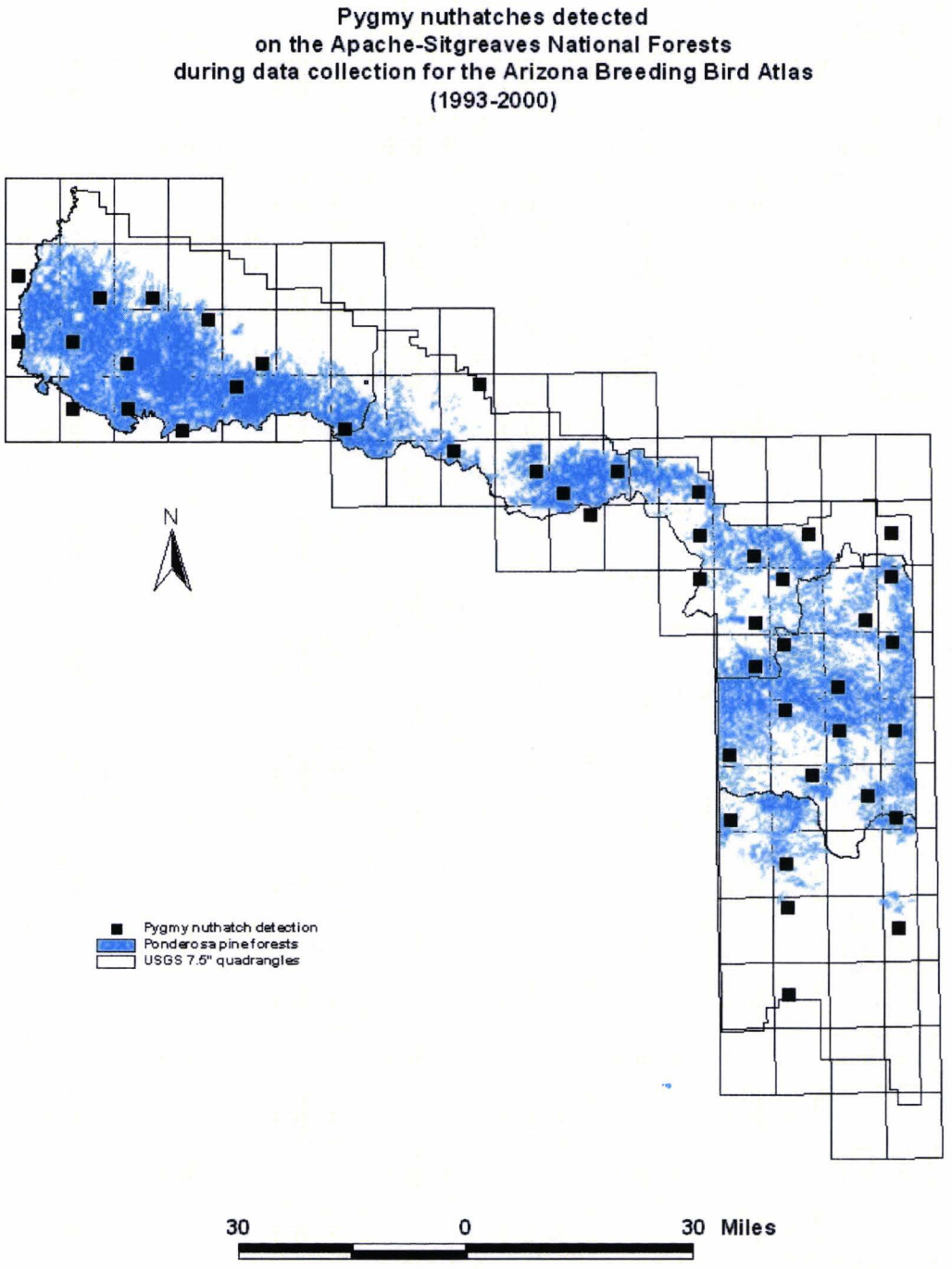

Figure 6. Distribution of pygmy nuthatch detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of mid- and high-elevation coniferous forests.

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Red squirrel (*Tamiasciurus hudsonicus mogollonensis*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves National Forest, the red squirrel is an indicator species for late-succession habitat (USDA 1987a, p.134). The Analysis of the Management Situation (AMS) (USDA Forest Service 1983) identified red squirrels as indicators of spruce-fir and mixed-conifer habitats. The red squirrel (*Tamiasciurus hudsonicus mogollonensis*) is a small, vocal and agile tree squirrel indigenous to the mixed conifer and spruce forests in its western US range. This solitary, territorial squirrel is a central place forager, and bases its home range around a cone cache, or midden, in which it stores green cones in late summer and fall. Middens are usually built next to a large tree, snag, or log.

Other habitat requirements for middens and home range areas are large trees (usually greater than 16-18" DBH), interlocking canopies that provide arboreal escape routes, and an abundance of dead and down woody material that provide substrates for fungi, another important food source, as well as provide under-the-snow runways during deep snow. Rarely found lower than about 7,500 ft elevation, these squirrels inhabit the cooler mixed conifer, aspen, and spruce and fir forest types on mountain summits, chilly ravines, and near cold or boggy areas within the deeper forest. Because larger Douglas-fir and Engelmann spruce provide more cones, mature to old growth forests are preferred. As displayed on Figures 1 and 2, the "potential" habitat for the red squirrel is well distributed across the Forest.

Management Activities or Natural Events That May Affect Habitat

Negative: Logging activities in mature stands, catastrophic wildfire.

Positive: Thinning smaller diameter trees to release and promote larger trees, fire suppression.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), includes specific "Standards and Guidelines" that are expected to maintain or improve red squirrel habitat components in Management Area 1 - Timberland including:

- Use integrated resource management in design of timber harvests to create habitat conditions needed by a variety of wildlife species in a cost effective manner (revised per Amendment 1).
- Manage to provide a variety of stand sizes, shapes, crown closure, edge contrast, age structure, and interspersion.
- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement p. 122-2).

- As needed to meet habitat capability, protect red squirrel caches at a density of one cache per 2 acres. Retain all trees within a 26-foot radius from the cache to maintain nest tree groupings.
- *Record of Decision for Amendment of Forest Plans* (1996) provides guidelines relative to the management of both Mexican spotted owl and northern goshawk habitat. The red squirrel is considered a prey species of the northern goshawk.

  Standards for ecosystem management in northern goshawk habitat include:

  > *Manage for old age trees such that as much old forest structure as possible is sustained over time across the landscape. Sustain a mosaic of vegetation densities (overstory and understory), age classes and species composition across the landscape. Provide foods and cover for goshawk prey* (USDA 1996, p. 91).

- Direction for the management of "old growth" habitats including well-defined, minimum criteria. Specifically, the amendment directs the allocation of "no less than 20 percent of each forested ecosystem management area to old growth" where "allocations will consist of landscape percentages meeting old growth conditions and not specific acres" (p. 122).
- Direction that defines vegetative objectives for PFAs.
- Direction extending the management of "Foraging Areas" to all forested landscapes outside PFAs with well defined objectives for vegetative structure. Management direction for snag densities, canopy-cover and other forest parameters are defined at the landscape level to promote sustainable prey populations for goshawks (e.g. related to snag densities) in addition meeting cover requirements for goshawks during the breeding season.
- Direction related to snag and down wood densities to promote sustainable prey populations specifically includes:
  - ✓ Leave at least 2 snags/acre and 3 downed logs/acre in ponderosa pine forests.
  - ✓ Leave at least 3 snags/acre and 5 downed logs/acre in mixed-conifer forests.
  - ✓ Leave at least 3 snags/acre and 5 downed logs/acre in spruce-fir forests.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was late-succession habitat. The Forest Plan EIS defined old growth for various forest vegetation types (USDA Forest Service 1987b, p. 299) based on the number and size of large trees, multiple canopy layers, snags, and down logs. The Forest Plan EIS discusses old growth deficits in the Sitgreaves NF (p. 229). The FEIS mentions that the goal for late-succession wildlife habitat is 21% (p. 200). The age class distribution of timber from the Forest Plan EIS (p. 150) shows that in 1987, the Forest had about 87,331 acres (10.8%) in stands greater than 140 years old. The Forest Plan specifies that 20% of each diversity unit is to be allocated old growth (USDA Forest Service

1987a, p. 122-2). Therefore, the goal of the Forest Plan was to increase old growth in the Forest.

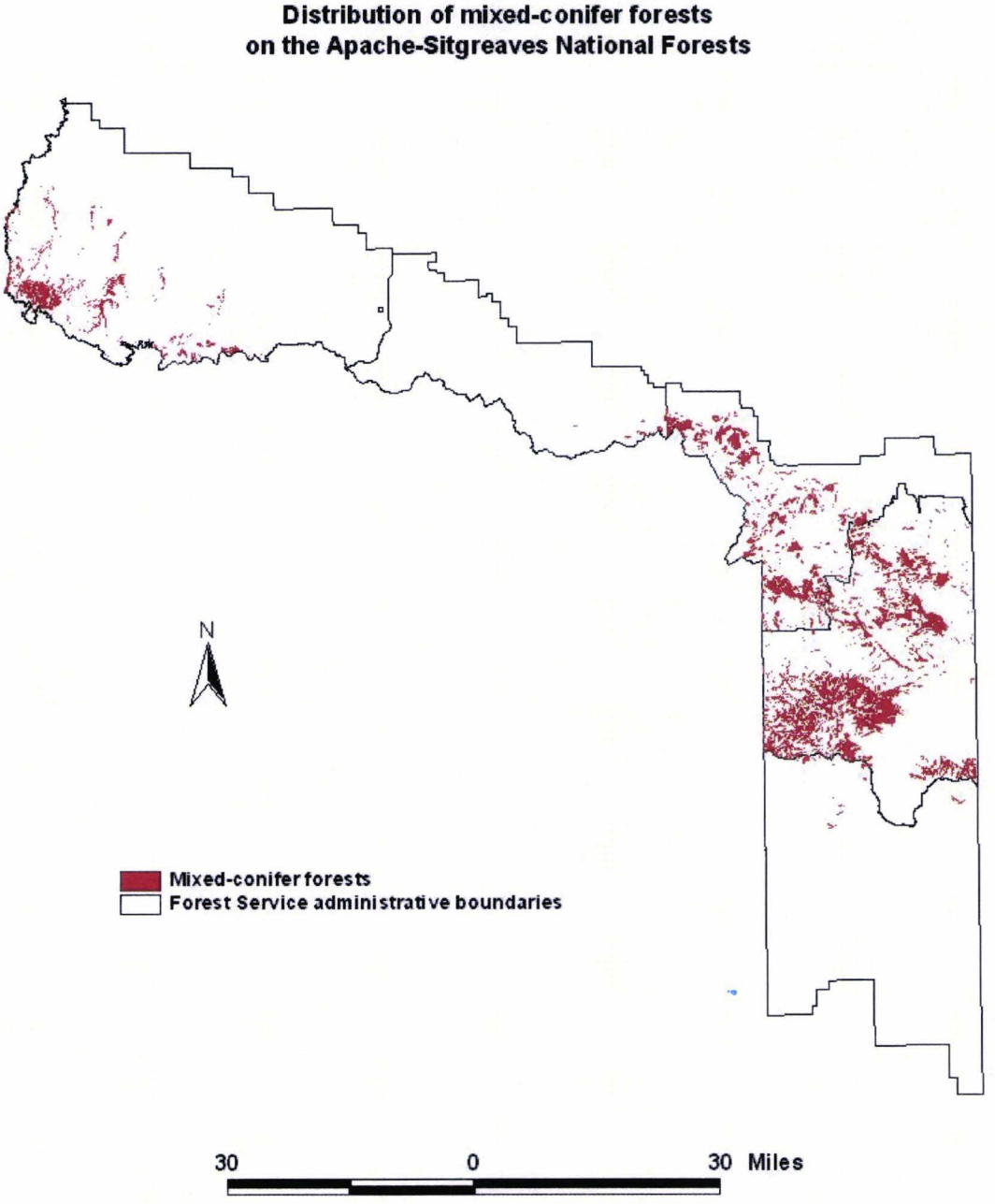


Figure 1. Distribution of mixed conifer forests on the Apache-Sitgreaves NF.

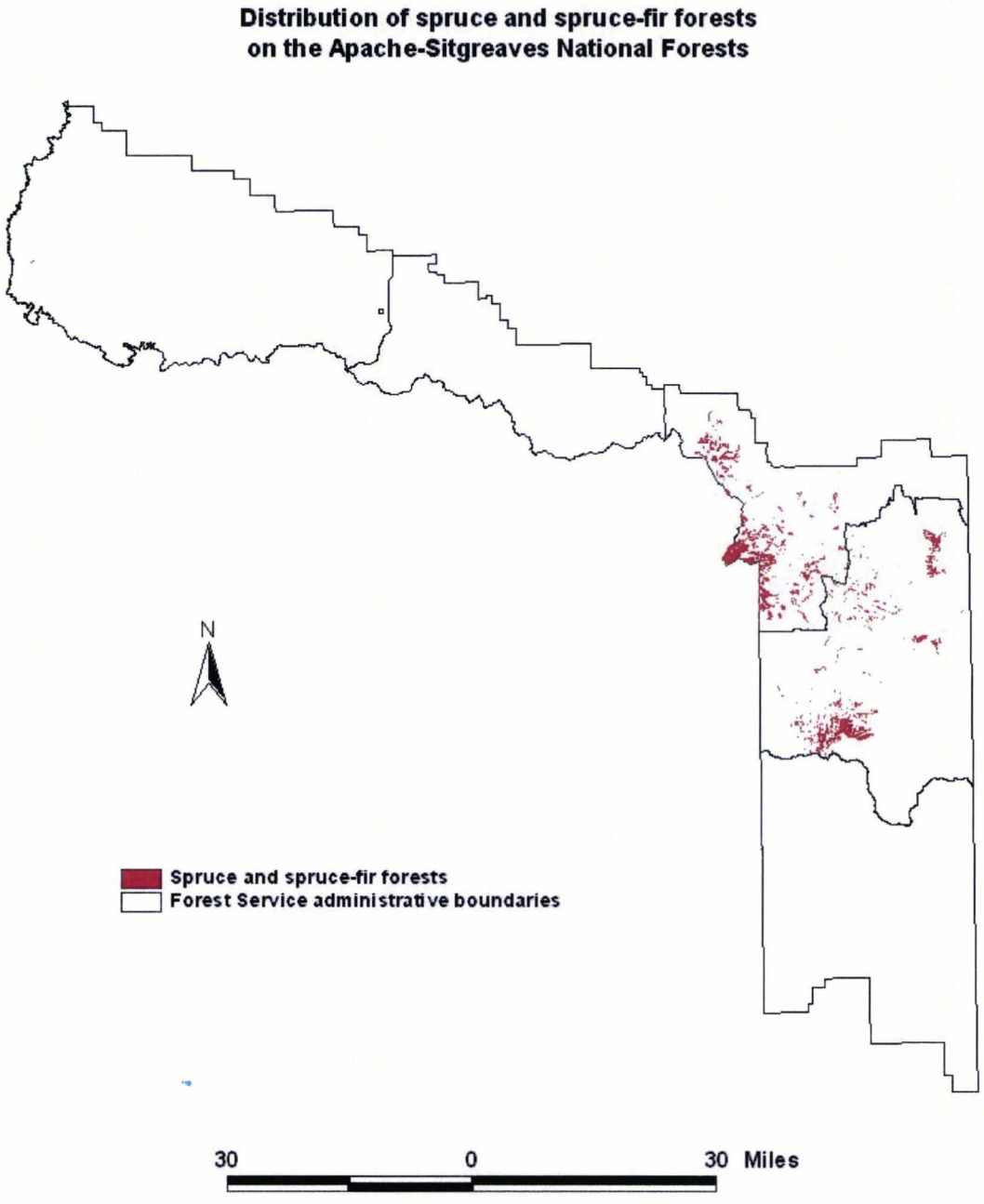


Figure 2. Distribution of spruce and spruce-fir forests on the Apache-Sitgreaves NF.

The Forest Inventory Assessment (FIA) data from 1996 (USDA Forest Service 2003a) that was used to model habitat quality for this species, estimated about 203,347 acres of mid- and high-elevation coniferous forests and aspen, of which about 20,951 acres of the coniferous forests were of mid- to larger- size class (>12" diameter) and 2,250 acres of aspen were of larger trees (>12" diameter). Based on this data, the HQI model estimates the habitat capability at approximately 50%. The identification and management of old growth forested habitats, in compliance with the Forest Plan (standards and guidelines), should maintain the habitat capability for red squirrels.

There are other factors to consider in making a determination of trend for late-succession habitat. Both natural and human events can affect forest succession.

Wildfire can destroy existing old growth and retard the development of future old growth by setting back forest succession. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 2. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771.

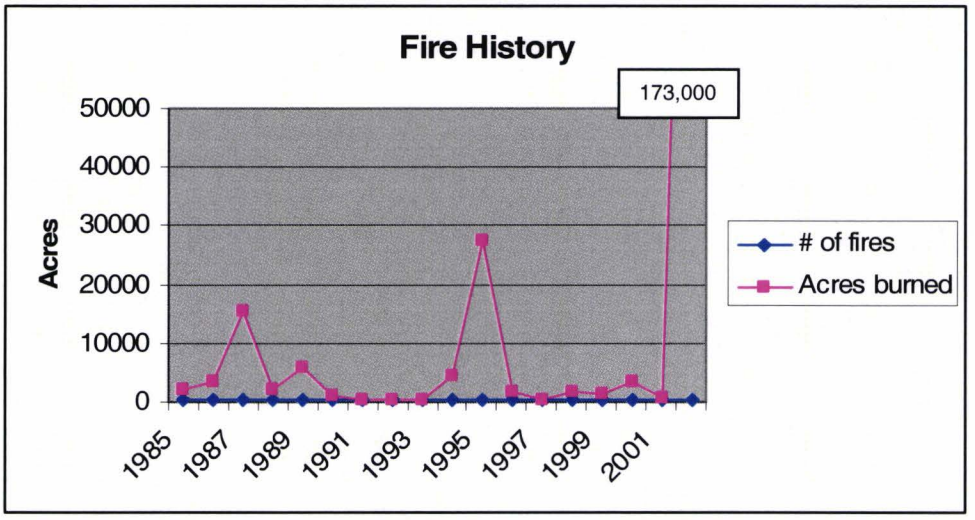


Figure 3. Summary of acres burned annually by wildfire in the Apache-Sitgreaves NF (1985-2002). Actual figure in 2002 was 173,000 acres.

The Apache-Sitgreaves NF has sustained large wildfires since 2000. The largest of these was the Rodeo-Chediski fire of 2002. That fire burned 173,107 acres in the Apache-Sitgreaves NF. However, less than 3,500 acres of mixed conifer habitat was present in the burn area prior to the fire. Not all of this mixed conifer forest burned at high or moderate severity. The estimated HQI for red squirrel in the Rodeo-Chediski fire area is currently at 50% (USDA Forest Service 2003b).

Timber harvest can reduce the amount of existing and developing late-succession habitat and effect squirrel density. The Forest Plan EIS considered effects to old growth in developing the Allowable Sale Quantity authorized under each alternative. The Forest

Plan authorized about 18,000 acres of timber harvest annually. The figure below depicts the levels of projected versus actual timber harvest over the life of the Forest Plan. Actual harvest information is from Forest records (Beal unpub. data). The projected harvest is based on the figure listed in the Forest Plan EIS for Alternative D of 18,080 acres annually (USDA Forest Service 1987b, p. 199). Actual harvest has varied considerably between years but has been declining overall as shown by the trend line in the graph below.

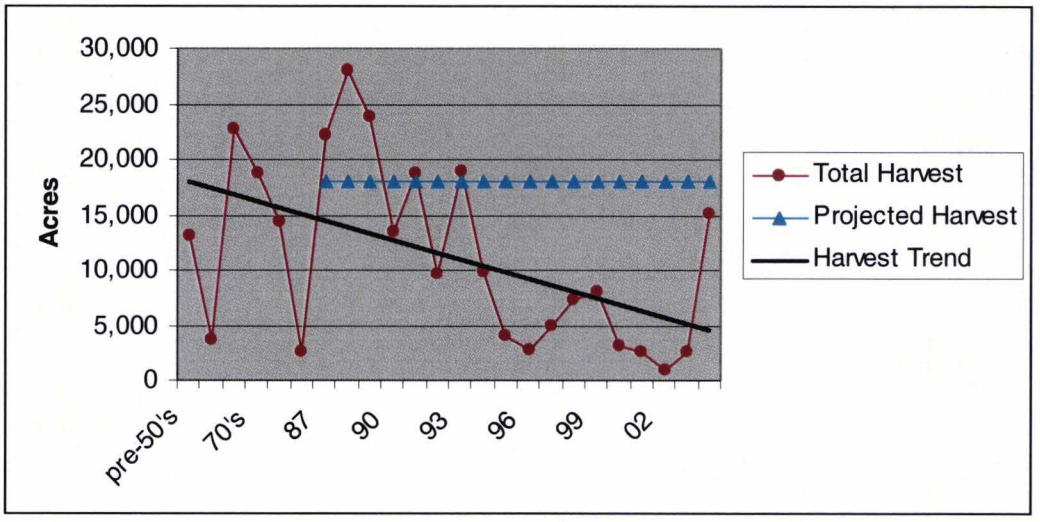


Figure 4. Actual vs. projected timber harvest in the Apache-Sitgreaves NF (1950-2004).

Specifically, Table 1 shows the amounts of timber harvest that have taken place in suitable red squirrel habitat since the Forest Plan was approved.

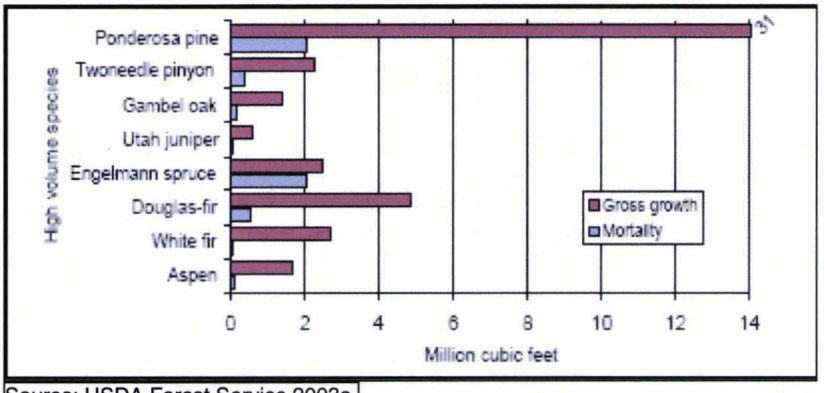
Table 1. Acres of timber harvest within the higher elevation mixed conifer and spruce-fir zones, Apache-Sitgreaves National Forest, Arizona, 1985-2001.

Harvest in mixed conifer and spruce-fir, combined	1985-1996 Acres	1997-2001 Acres	Total Acres
Overstory/Partial Removal	6,946	0	6,946
Intermediate & Individual Selection	7,879	1,271	9,150
Seed cut	1,040	58	1,098
Clearcut	686	8	694
Group Selection	564	59	623
Total Acres	17,115	1,396	18,511
Avg. Acres/Year	1,426	279	-

Two Districts on the Forest, Alpine and Springerville, permit commercial cone collection from red squirrel middens between September 1 and October 15. Usually, each district writes only one contract. One of the conditions of these contracts states that each contract allows collection of no more than 1000 bushels of cones per year. Collectors can disturb only one-half of the midden. Such direct disturbance of middens by cone collectors can affect the integrity of the cone cache, directly takes food away from the

animals, may reduce over-winter survival of animals dependent on those middens, and probably increases energy output as squirrels attempt to replenish depleted winter food stores. How much of an effect such collection may have on local populations of squirrels is unknown. It is unlikely that this level of cone collection has any effect on Forest-wide populations.

Another factor in the development of late succession across the Forest is the annual rate of forest growth. The FIA report (USDA Forest Service 2003a) discusses the net annual growth of trees in the Forest by comparing estimated gross annual growth and gross annual mortality. Total mortality is about 13% of total annual growth. Figure 2 compares gross annual growth to mortality for eight common forest types. Growth in most types, except Englemann spruce, far outstrips mortality in the Apache-Sitgreaves NF. Because Engelmann spruce grows at higher elevations with colder temperatures and a shorter growing season, it has a slower growth rate. Thus, the forest is getting older and thicker over time. This is another indication that late succession is continuing to develop in the Forest.



Source: USDA Forest Service 2003a.

Figure 5. Gross annual growth of live trees 5 inches diameter and greater compared to mortality on all forested land in the Apache-Sitgreaves NF, 1996.

Based on the information currently available, **the current habitat condition for this species is fair to good, with an overall upward trend in late succession habitat** in mixed conifer, spruce and aspen due to reduced harvest levels, continuing strong forest growth, and endemic insect infestations. There have been some recent losses of mixed conifer habitat due to wildfire but these losses are small on a forest-wide scale. Suitable habitat remains well distributed within the burn area. The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

POPULATION TREND

Red squirrels are year-round residents of forest types from Alaska to Newfoundland, south to the southern Appalachians and through the Rocky Mountains to Arizona and New Mexico. This species is widespread in North America and abundant in many areas (NatureServe 2002). Overall, the US population is stable.

The NatureServe database (www.natureserve.org/explorer) documents that throughout its range, the red squirrel is listed as "G5", (i.e., globally secure and common, widespread and abundant). Within the United States, the red squirrel is listed as "N5" (i.e., secure and common, widespread, and abundant). In Arizona, the red squirrel is listed as "S5" (i.e., secure, common, widespread and abundant). Figure 6 displays population trend data for the species across its range.

Arizona

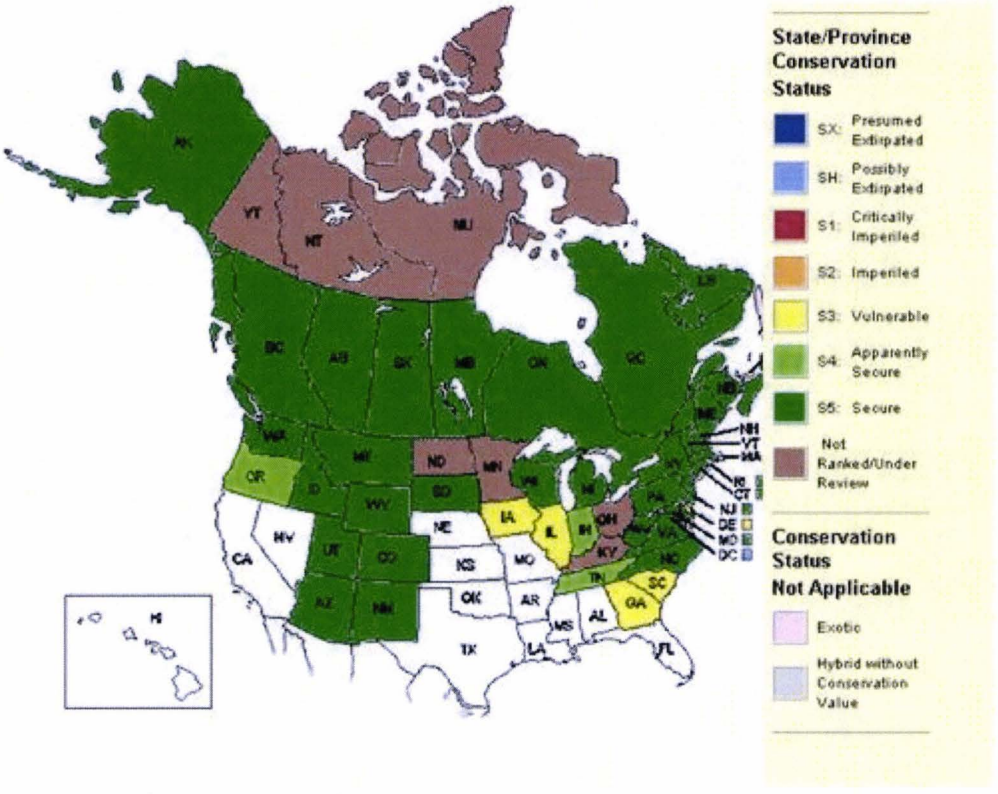


Figure 6. Distribution map of Red squirrel in North America displaying conservation status by state (Natureserve 2005).

Information from the Bison-M database indicates that this species is fairly common throughout mixed conifer and spruce-fir forests of New Mexico and Arizona (NMDGF 2001). The red squirrel is managed as a small game species by Arizona Game and Fish (AGF 2004). The red squirrel is the most diminutive of the squirrels of Arizona and does contribute substantially to the annual squirrel harvest. There is no indication or documentation that red squirrels are declining in the Southwest.

Apache-Sitgreaves National Forest

On the Apache-Sitgreaves National Forest, this species is commonly observed throughout the mixed conifer and spruce-fir habitat type. Characteristic mounds or middens confirm red squirrels presence and are found throughout red squirrel habitat on the Forest. Red squirrel clippings, cone felling and stripping are also a usual sign of

occurrence. Red squirrel populations vary widely from year to year, depending mostly on cone crops and reproductive success (Brown 1984, Young 1995). Densities may range from about one squirrel per acre in northern latitudes to less than 1 squirrel per ten acres in more southerly habitats.

There is one project being undertaken by University of Arizona researchers that gives general trends in squirrel density on the Forests in the Strayhorse (TRS) and Escudilla (SFE) areas. Below is a table with excerpts from data collected in those areas since 1997 (unpub. data, by permission of John Koprowski, University of Arizona). The Strayhorse area is 118 acres in size and the Escudilla area is 148 acres. Only spring squirrel and midden density is provided, when the population is at its lowest because no young of the year are present outside the nest. Over four years squirrel densities ranged from 0.78 - 1.46 squirrels per acre. Midden densities ranged from 1.89 to 2.19 per acre (Koprowski et al. 2002). Squirrel densities fluctuated much more than did midden densities. This is comparable to densities reported elsewhere that range from about 1 per 3.2 ha (Pinaleno Mountains, southeastern Arizona) to 1 per 0.2 ha (Layne 1954, Davis 1969, USFWS 1987).

Table 2. Summary of red squirrel population data for Strayhorse (TRS) and Escudilla (SFE) study areas, Apache-Sitgreaves National Forest, White Mountains, Arizona.

	Spring 1997		Spring 1998		Spring 1999		Spring 2000		Summer 2001	
Study Area	**TRS**	**SFE**	**TRS**	**SFE**	**TRS**	**SFE**	**TRS**	**SFE**	**TRS**	**SFE**
# Middens	223	-	229	304	229	310	231	308	233	310
Midden Density (#/ac)	1.89	-	1.94	2.06	1.94	2.10	1.96	2.08	1.98	2.10
# Occupied Middens	94	-	124	194	113	216	97	196	92	154
Squirrel Density (#/ac)	0.8	-	1.05	1.31	0.96	1.46	0.82	1.32	0.78	1.04
% Occupied Middens	42	-	54	64	49	70	42	64	39	50

Many studies, reviewed by Klenner and Krebs (1991), indicated that red squirrel population density varies with cone crops. Rusch and Reeder (1978) reported that summer populations fluctuated between 67 and 151 red squirrels per 2,500 acres in mixed habitats.

Taking into account the continuing occurrence of the red squirrel across the Forest in suitable habitat, the abundance and wide distribution of suitable habitats across the Forest, upward habitat trends for late succession habitat in the Forest, and the presence of a harvestable surplus in the red squirrel population, it appears that the Forest supports a well distributed reproducing population of this species. **Currently, red squirrel populations in the Apache-Sitgreaves National Forest are considered to be stable, and likely near potential.**

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Red-naped (Yellow-bellied) Sapsucker (*Sphyrapicus nuchalis*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves NF, the red-naped sapsucker is a management indicator species for aspen snags. The red-naped sapsucker (*Sphyrapicus nuchalis*) is a migratory species that breeds from eastern Alaska through the Rocky Mountain forests of Canada, south through the Sierra Nevada and Rocky Mountains of the United States to central Arizona, northern New Mexico, and extreme western Texas (Phillips et al. 1964, Terres 1996, DeGraaf et al. 1991) (Figure 1). In Arizona, the species breeds in the deciduous and deciduous/coniferous forests of the White Mountains and along and north of the Mogollon Rim (Monson and Phillips 1981). The winter range of this species includes the extreme southern portion of its summer range to southern California, central Arizona, central New Mexico, Baja California, and northwestern Mexico (DeGraaf et al. 1991, Terres 1996).

Red-naped sapsuckers are associated with deciduous and deciduous/coniferous forests, especially aspen and riparian woodlands (Ehrlich et al. 1988, Terres 1996). Tree species commonly associated with red-naped sapsucker habitat include aspen, cottonwood, willow, alder, sycamore, ponderosa pine, spruce, white fir and Douglas-fir. While observed in old-growth forests, this species has been found in greater abundance in harvested areas (Finch et al. 1997, Hejl et al. 1995, Hutto et al. 1993). The red-naped sapsucker is a primary cavity nester that generally nests in aspen snags or live aspen trees having a shelf fungus (*Fomes igniarius* var. *populinus*) that speeds the rate of heart rot (Daily 1993). They will also nest in other deciduous trees and occasionally conifer snags (Latta et al. 1999). Red-naped sapsuckers forage most often on the sap and soft cambium layer of deciduous trees (willows, cottonwoods, aspens, and walnuts; Latta et al. 1999) but also will feed on the sap of conifer trees (Oliver 1970). Fruit, buds, berries, and nuts are also consumed when available (Ehrlich et al. 1988). Reynolds et al. (1991) listed downed logs and woody debris as important sources of insect food.

Hutto et al. (1993), Hejl et al. (1995), and Finch et al. (1997) reviewed six studies that analyzed red-naped sapsucker abundance in harvested and unharvested ponderosa pine forests in the Southwest and Rocky Mountains. Their findings were that red-naped sapsuckers were more abundant in partially cut forests than in uncut forests. Mills et al. (1996) found red-naped sapsuckers to be equally abundant among structural stages of aspen/birch in the Black Hills but determined sapling/pole-aspen/birch stands with 41-70% canopy closure to be optimum habitat. Red-naped sapsucker abundance was positively correlated with the density of aspen/birch snags >5.9" DBH. Ponderosa pine was considered to be relatively low quality habitat for red-naped sapsuckers in this study (Mills et al. 1996).

The Arizona Partners in Flight Bird Conservation Plan (Latta et al. 1999) recommends harvesting to maintain and improve red-naped sapsucker habitat. Latta et al. (1999) identified the primary threat to red-naped sapsucker habitat as a "gradual decline in mature aspen stands and mixed-deciduous forests adjacent to water sources". To offset this decline in mature aspen stands, Latta et al. (1999) recommend promoting "silvicultural and fire management practices that support aspen regeneration". Although they nest in older trees >10" in diameter, the habitat objective for red-naped sapsuckers in Arizona is to manage for different ages of aspen stands (33% seedling, 33% sapling/pole, 33% mature/old-growth; Latta et al. 1999).

The red-naped sapsucker is considered a "double keystone" species for its role in excavating cavities and drilling sap wells, which are both used by a variety of other species for nesting and feeding (Nature Serve 2005).

Management Activities or Natural Events That May Affect Habitat

Negative: Gradual decline of aspen in mature aspen stands and mixed-deciduous forests adjacent to water sources (Latta et al. 1999), fire suppression, excessive gathering of dead and down aspen for fuelwood.

Positive: Regeneration of aspen through prescribed fires, wildfire, and vegetation management. Maintenance of standing dead aspen trees, reducing open road densities in areas of highly accessible aspen, dead and down material, and disease infestations.

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

The Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (USDA Forest Service 1987a), includes specific "Standards and Guidelines" that are expected to maintain or improve snag habitat and aspen forests in Management Area 1 including:

- Provide big game, nongame, and upland game habitat in aspen (p. 123).
- Manage to provide a variety of stand sizes, shapes, crown closure, edge contrast, age structure, and interspersion (p.123).
- Manage for an interspersion of conifer groups when present. Limit conifer groups to one-acre groups per 10 acres of aspen (p. 123).
- Where there has been manipulation to induce aspen regeneration, manage livestock to protect regeneration (p. 123).
- Maintain the existing total acreage of aspen stands in the Forest. This may be done by eliminating existing stands and creating new ones to replace them, maintaining existing stands, or a combination of both (p. 132).
- Manage aspen stands for a combination of timber, aesthetic, and wildlife values. Aspen will be included in commercial timber sales to the extent needed to meet management objectives, including aspen regeneration (p. 133).
- Clearcuts will be the preferred method of aspen regeneration. Conifers will be removed from regenerated aspen stands (p. 133).
- Rotation age for aspen will be 80-100 years (p. 133).
- Natural regeneration with site preparation will be the only regeneration method for aspen (p. 133).
- The preferred site preparation method for aspen will be by prescribed broadcast burning (p. 133).
- Manage aspen stands under the even-aged system using the clearcut method (p. 133).

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

The key habitat feature for which this species was selected as a management indicator species was aspen snags. However, two levels need to be considered when looking at red-naped sapsucker habitat across the Forest. First is the overall aspen habitat type. The "Habitat Quality Index (HQI) Model" (version 18), developed by the Southwestern Region, was used to evaluate the present habitat capability of the Forests for the red-naped sapsucker. Based on the 1996 FIA data and habitat coefficients in the HQI model, there is approximately 800,000 acres of suitable and potential red-naped sapsucker habitat. This habitat currently has an overall habitat quality rating of 0.4 (i.e., the habitat will support 40% of maximum potential populations). The

foraging habitat quality rating is 0.6 while the cover habitat quality rating is 0.3 for the red-naped sapsucker.

In the Forest, mid- to late-seral stage aspen are declining, due to both natural causes and management actions to regenerate stands. Some early-seral-stage stands are being created through wildfire and management activities, but recruitment is limited primarily due to grazing by animals. FIA data indicates that gross annual growth in aspen far exceeds mortality. A comparison of estimated acres of aspen in the Forests (see Figure 1) based on information in the Forest Plan EIS, the 1996 FIA data, and the current GIS vegetation data indicates that there has been some increase in the amount of aspen across the Forests during the life of the Plan. However due to differences in data collection techniques, the increase may not be real. New FIA data will be collected in 2005 that will give a clearer picture of aspen habitat trend on the Forests.

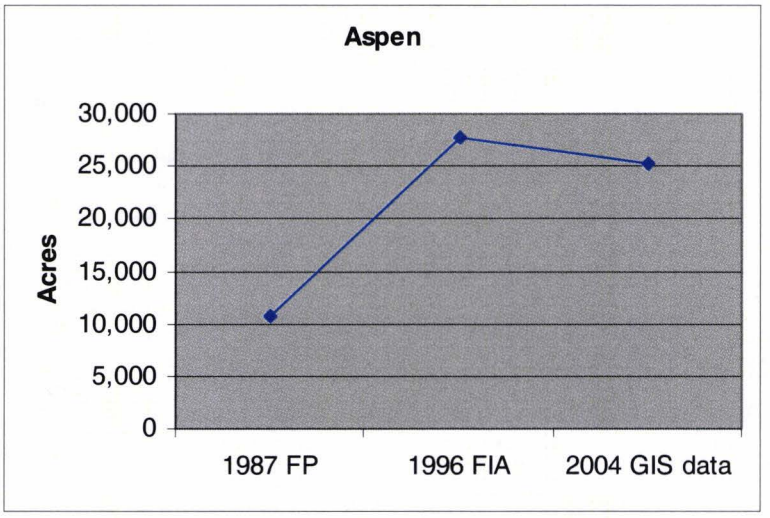


Figure 1. Apparent amount and trend of aspen habitat in the Apache-Sitgreaves NF since 1987.

Total annual timber harvest history in the Forest is shown in Figure 2. However, not all timber harvest directly benefits habitat for the red-naped sapsucker. Records of harvest levels for the forest (Beal 2005) indicate that there have been only 829 acres of timber harvests that could encourage the regeneration of aspen in aspen stands or mixed-conifer stands since 1996. Included were all types of treatments in aspen and mixed-conifer stands. At the same time, trees are growing in other parts of the Forest and habitat conditions there are gradually declining as aspen is out-competed by later-succession conifer species.

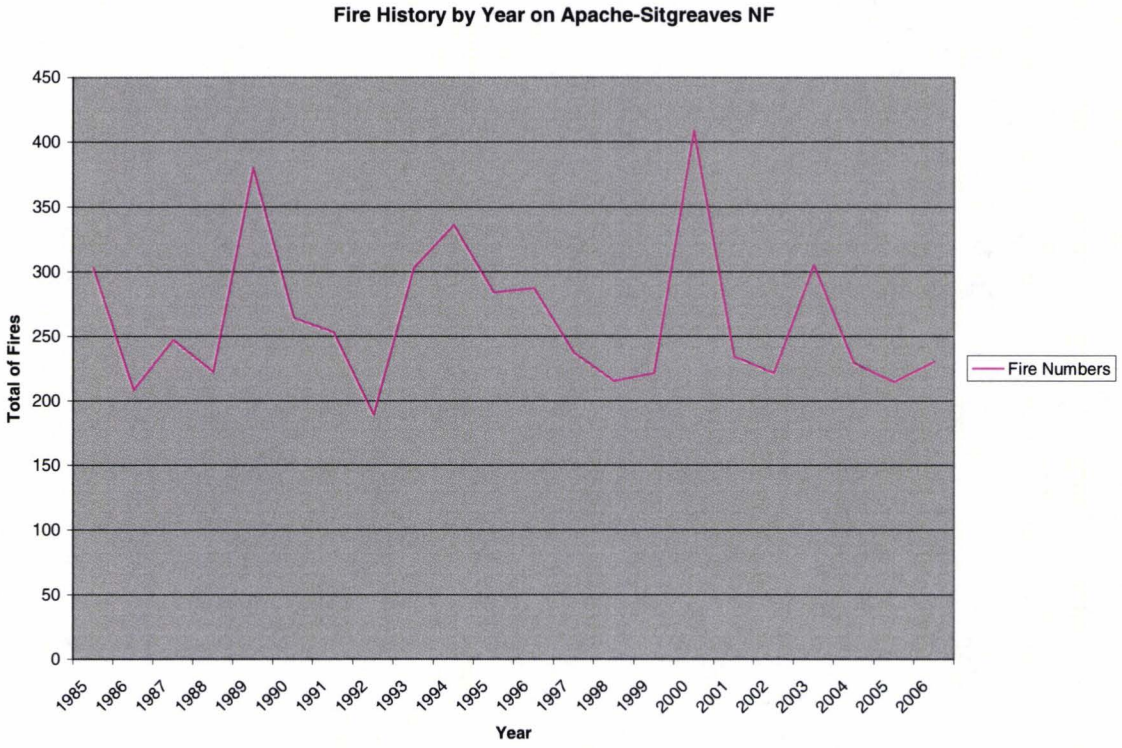
Treatments in spruce-fir, mixed-conifer, and ponderosa pine	1985-1996 Acres	1997-2001 Acres	2002-2006 Acres	TOTAL ACRES
Overstory/Partial Removal	48,728	129		48,857
Intermediate & Individual Selection	80,103	17,119	28,289	125,511
Seed cut	16,319	1,701		18,020
Clearcut	1,164	8		1,172
Group Selection	2,533	2,320	1780	6,633
Salvage			23,793	23,793
Total acres	148,847	21,277	53,862	224,986
Avg. Acres/year	12,404	4,255	10,772	10,714

Figure 2. Annual timber treatments in the Apache-Sitgreaves NF (1985-2006).

Wildfires will also affect aspen forests. Since 1985, acreage burned in the Apache-Sitgreaves National Forests from wildfires totaled less than 2,000 acres per year for 11 years out of 18 (Figure 3). From 1985 to 1996, wildfires impacted about 5,356 acres each year in the Forests. From 1997 to 2001 (after FIA data collection), an average of 1,477 acres each year have been impacted to some extent by wildfires in the Forests. Information is not available summarizing cover types impacted by these fires, or the acreage actually impacted by "high-intensity" conflagrations. It is likely that high-intensity fires impacted only a small percentage of these acres (J. Thompson, pers. comm.). However, areas that are burned with high and moderate intensity and have potential for aspen regeneration can produce new aspen stands.

The Rodeo-Chediski Fire burned approximately 176,000 acres on the Sitgreaves National Forest in 2002, of which approximately 25,000 acres could potentially produce aspen regeneration. Early post-fire monitoring suggests that wild ungulates may be having a negative effect on the recruitment and growth of aspen sprouts. Given the wide distribution of red-naped sapsuckers across the Forests (Figure 7), the continued recurrence of wildfires is likely to maintain or improve the abundance and distribution, and improve the overall habitat capability of red-naped sapsuckers in the Forests.

The second level of habitat that needs to be considered in assessing Forestwide habitat trend for the red-naped sapsucker is the abundance of dead and down wood. Red-naped sapsuckers use snags for nesting. The 1996 FIA for the Apache-Sitgreaves NF estimated there were about 44 million standing dead trees (snags) greater than 1 inch in diameter, averaging 25 snags per acre. Over half of the snags occurred in the ponderosa habitat type. However, not all of these snags have much value for wildlife. About 24% of these snags were between 5 and 10.9 inches in diameter. These snags provided foraging habitat for many species of insectivorous birds. However, most cavity-nesting birds prefer even larger diameter snags for nesting purposes. Sapsuckers prefer snags or decayed live trees 6" or greater in diameter with the average size of nest trees in one central Arizona study being >14" in diameter (Li and Martin 1991).



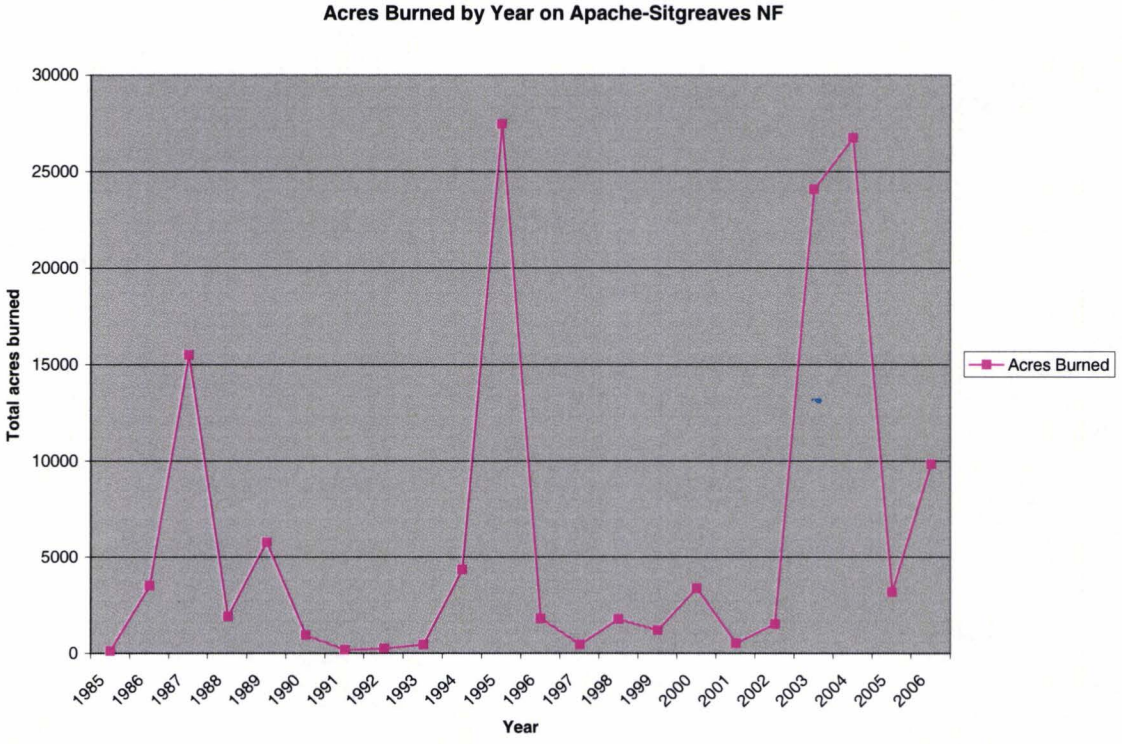


Figure 3. Summary of fires and acres burned annually by wildfire and prescribed burn in the Apache-Sitgreaves NF (1985-2002). Actual figure in 2002 was 173,000 acres due to the Rodeo-Chediski fire.

The FIA data indicates that there were about 8.1 aspen snags per acre greater than 12" diameter available in aspen stands with other large diameter aspen snags scattered in other forest types (e.g. Douglas-fir and white fir). However, the vast majority of aspen snags are less than 5 inches in diameter. Personal use firewood gathering may have contributed to loss of larger aspen snags. In other areas of the Forests, snags are being recruited as older patches of aspen die out. A small 10-year study of aspen decline has found that trees are rapidly becoming snags, but the rate has remained steady (Martin 2002).

Snags are not long lived. Snag fall-down rates vary by species, diameter, and cause of mortality. Snag fall-down rates for the Apache-Sitgreaves NF have not been estimated, but fall-down rates for other forests with similar habitat types indicate that most ponderosa pine snags persist for 2-20 years (Bull et al. 1997). Thus, the persistence of snags across the landscape is dependent on continuing tree mortality. Mortality in the Apache-Sitgreaves NF was estimated based on 1996 FIA data (USDA Forest Service 2003a) at about 13% of gross annual growth. Forty-five percent of this mortality was caused by disease, 28% by fire, and 15% by insects. The remaining 12% was attributed to weather, suppression, and animal damage, in respective order of prominence.

Snags continue to be created by insects and disease in the Forest. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 4. Infestations vary widely from year to year, but continue to be present in the Forest, creating pockets or larger areas of new snags. Aspen defoliators have been active each of the survey years.

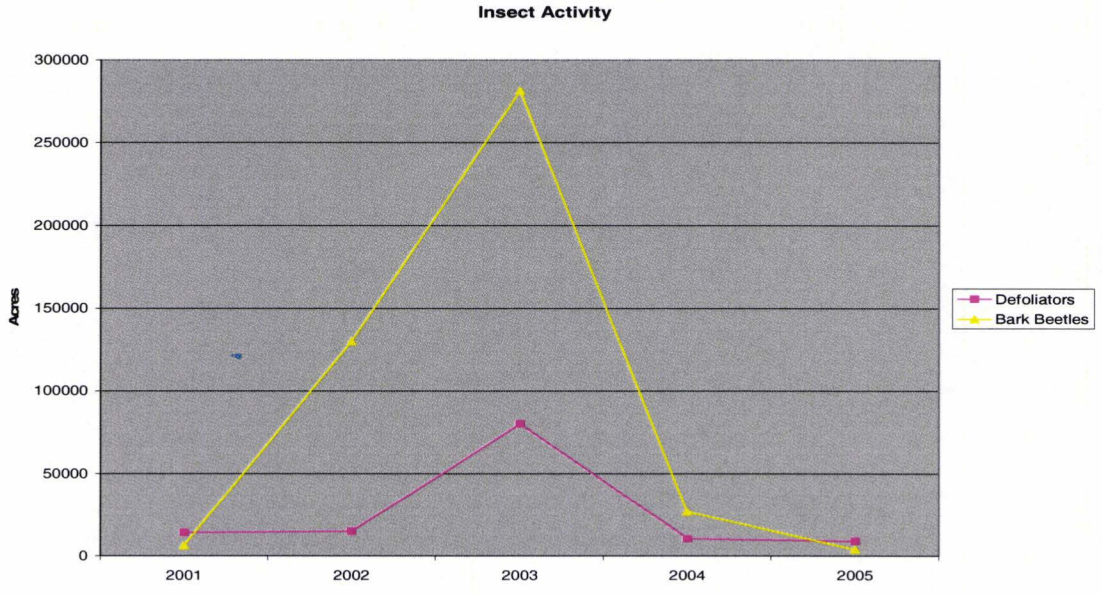


Figure 4. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2005).

Based on the information, available **habitat quality for the red-naped sapsucker is fair with a stable trend.** Ongoing forest growth and declining timber harvest will tend to offset gains in aspen regeneration due to fire and insects. However, **conditions are likely well below potential.** For more information on forest growth and snag habitats, see Appendix A.

POPULATION TREND

The Global Heritage State Rank for red-naped sapsuckers is G5 (i.e. globally secure and common, widespread, and abundant) for this species across its range, although it may be rare in parts of its range, particularly on the periphery. In the United States, breeding red-naped sapsucker populations are ranked N5 (Secure); non-breeders are not ranked. Overall, the US red-naped sapsucker population is stable (3.29, p=.00471) (Sauer et al. 2004).

The red-naped sapsucker is a widely distributed breeder in the Rocky Mountain region (see Figure 5) from south-central British Columbia, southwestern Alberta, and western Montana south, east of Cascades, to east-central California, southern Nevada, central Arizona, southern New Mexico, and extreme western Texas (Davis and Guadalupe mountains) (NatureServe 2005). The species winters in southern California (casually in Oregon), southern Nevada, central Arizona, and central New Mexico south to southern Baja California, Jalisco, Durango, Coahuila, and Nuevo Leon (NatureServe 2005).

Arizona

The red-naped sapsucker is considered a common to fairly common summer resident of both the Apache-Sitgreaves NF and the adjacent Gila NF in New Mexico (USDA Forest Service 1996; USDA Forest Service 1997). In Arizona, this species is at the southern periphery of its breeding range.

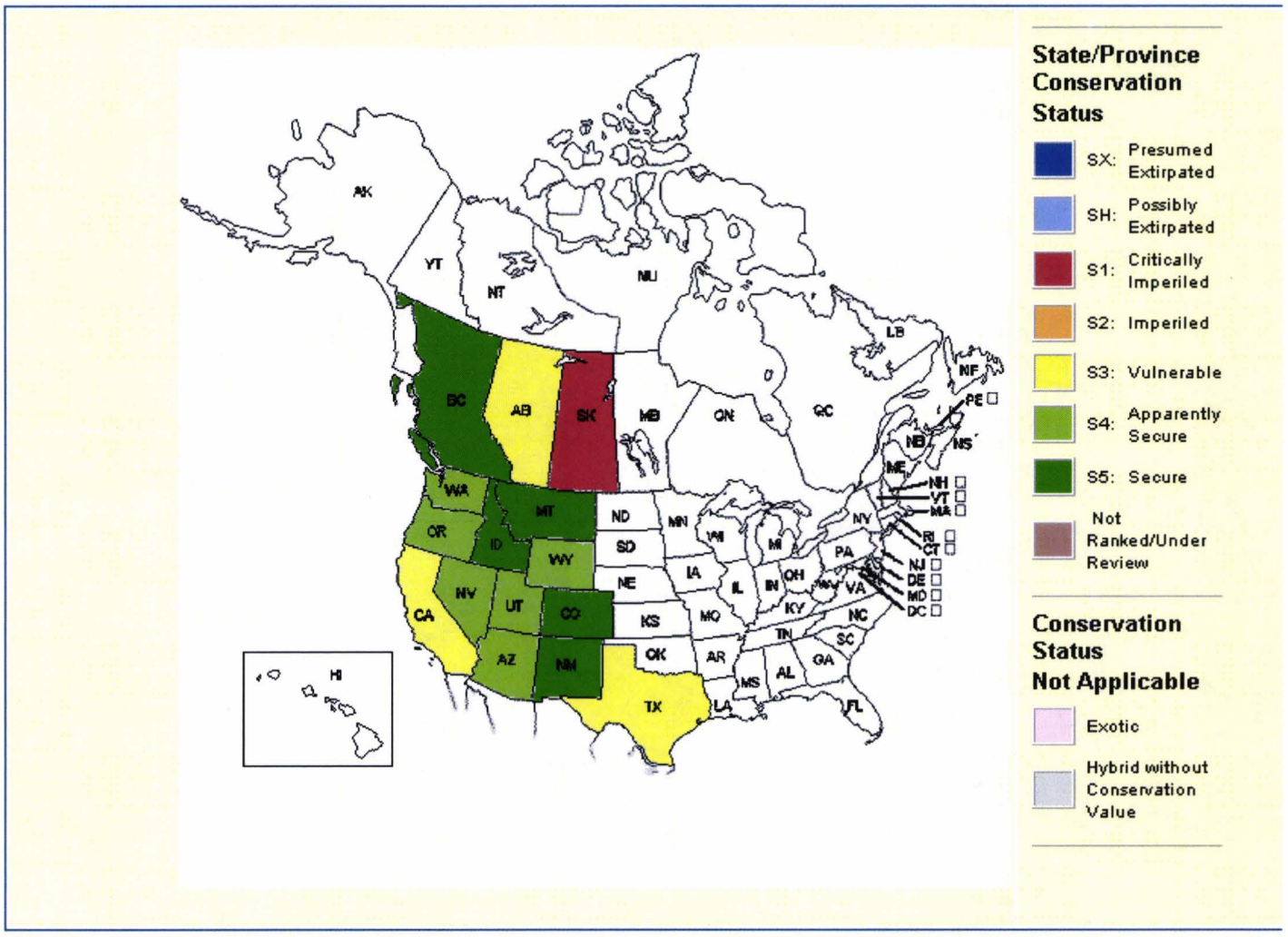


Figure 5. Distribution map of the red-naped sapsucker in North America displaying conservation status by State (NatureServe 2005).

BBS data (Sauer et al. 2003) for Arizona from 1966-2003 shows a nonsignificant ($p = 0.06$), negative population trend of –27.26% per year (see Figure 6). Arizona data for this species is highly variable as only three survey routes are included in the analysis. The relative abundance of red-naped sapsuckers for each of the three Arizona routes from 1966-2003 is 0.14 birds. Figure 6 shows the percent population change per year based on BBS data across its range.

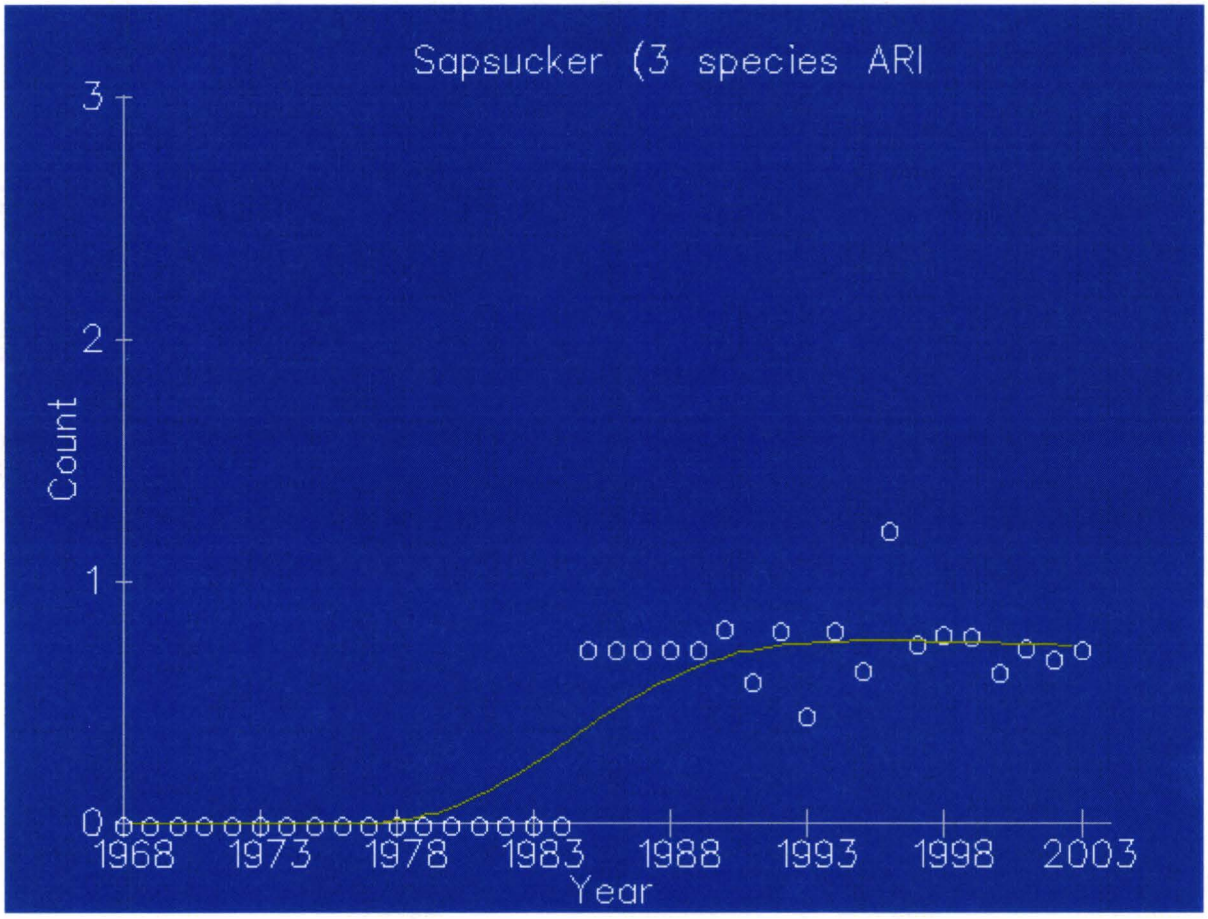


Figure 6. Estimated population trend for red-naped sapsucker in Arizona (Sauer et al. 2004)

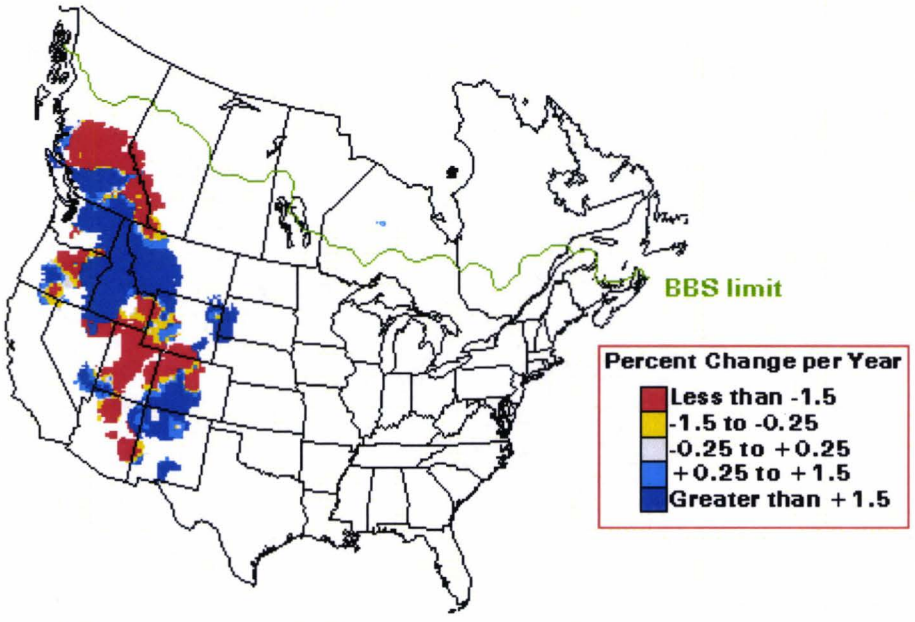


Figure 7. Percent change per year of red-naped sapsucker populations across species range (Sauer et al. 2004).

The National Audubon Society (2003) publishes Christmas Bird Count (CBC) data for this species in Arizona (See Figure 8). This data appears to be stable over time, with annual fluctuations.

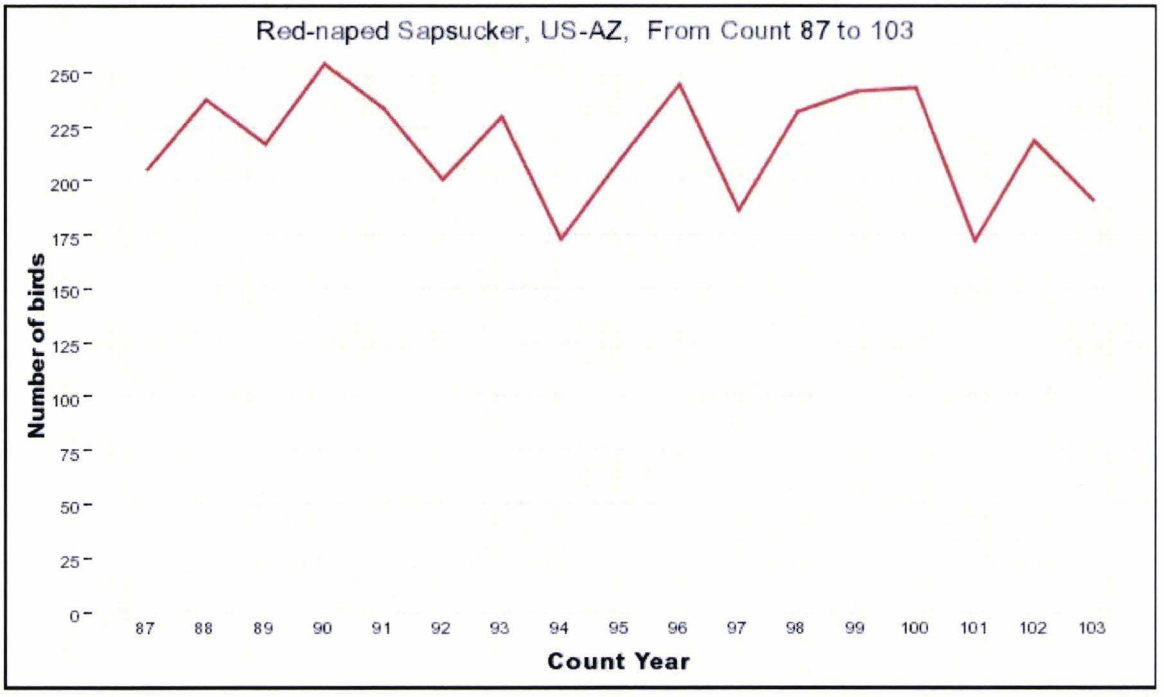


Figure 8. Red-naped sapsucker population trend data for Arizona from Christmas Bird Count data (National Audubon Society 2003).

Arizona Partners In Flight (PIF) developed a species prioritization process (Latta et al. 1999) to determine which species and habitats are most in need of conservation. The red-naped sapsucker was not identified as a species of concern in Arizona during that effort (Rosenberg 2004). Arizona PIF also identified statewide population objectives for the red-naped sapsucker:" Maintain the current statewide population of 31,000 individuals." The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort also did not identify the red-naped sapsucker as a species of concern in this region.

Apache-Sitgreaves National Forest

The Arizona Game and Fish Department surveyed a portion (i.e. 1/6th) of each of the 7.5" USGS quadrangles that include lands managed by the Apache-Sitgreaves National Forests. Of these, 65 sectors occurred on ASNF lands. Breeding Red-naped sapsuckers were detected, from 1993 to 2000, at least once in 19 of these sectors distributed across the forest (Figure 9).

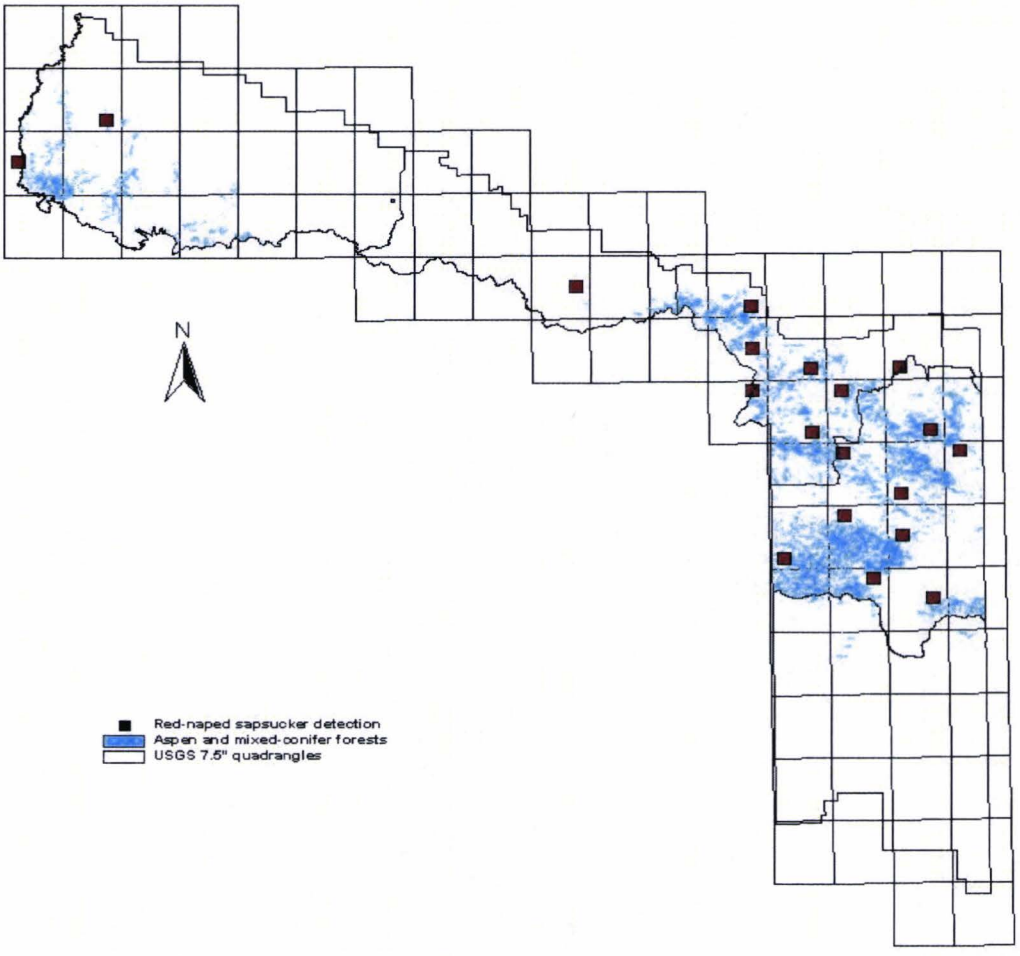


Figure 9. Distribution of red-naped sapsucker detections in the Apache-Sitgreaves National Forests during data collection for the Arizona Breeding Bird Atlas (1993-2000) in relation to the general distribution of aspen and mixed conifer forests.

Five Breeding Bird Survey routes are located in the Forest. Most of these routes have been surveyed annually since 1992. Red-naped sapsuckeres were detected on only one of the five routes, the "Sprucedale" route (Table 1). This trend information should be interpreted with caution due to very small sample sizes on each route (Sauer et al. 2004). These trends should not be considered significant. However, the information for each route is relevant to documenting the general distribution and persistence of the species in the Forests.

Table 1. Breeding bird survey trend estimates for red-naped sapsucker

BBS Route	Trend Estimate	P value	Number of Years	Average Count Per Route/Year
Sprucedale	-14.35	0.33004	11	0.73
Forest Lakes	N/A	N/A		
Alpine	N/A	N/A		
Clay Spring	N/A	N/A		
Pinetop	N/A	N/A		

Dr. Tom Martin of the USGS Biological Survey, Cooperative Wildlife Research Unit, has conducted 15 years of bird productivity studies in snowmelt drainages on the Mogollon Rim on the west end of the Forest. The Breeding Biology Research and Monitoring Database (BBIRD) study compiled the number of red-naped sapsucker nests identified in snowmelt drainages on the Mogollon Rim over the past 10 years. Numbers of nests has varied, starting with 28 nests in 1991, and ending with 25 nests in 2000. The greatest number of nests was located in 1998, followed by a low of 21 nests in 1999 (Figure 10) (Martin, 2002 unpubl. data). The BBIRD dataset indicates that red-naped sapsucker populations are stable on the extreme western portion of the Apache-Sitgreaves National Forests. The populations fluctuate over time, but show no indication of increasing or decreasing.

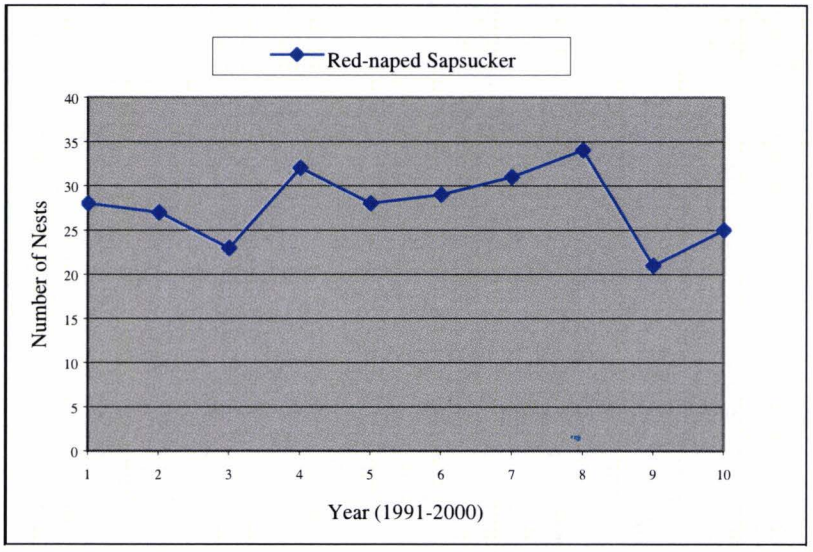


Figure 10. Ten-year trend for breeding pairs of red-naped sapsuckers in snowmelt drainages on the Mogollon Rim (Martin, unpubl. data).

Recent MIS monitoring efforts in the Black Mesa Ranger District (unpublished data) conducted from 2001-2005 included observations of red-naped sapsuckers (n=0, 0, 2, 1, 1). The birds were seen where ponderosa pine, pinyon-juniper, oak and aspen stands were present.

Taking into account the continuing occurrence of red-naped sapsuckers across the Forest in suitable habitats, stable habitat trends for aspen, mixed-conifer, and snag habitat in the Forest, documented nesting in the Forest, and the overall population trend across its breeding range, it

appears that the Forest supports well distributed reproducing populations of this species. **Currently, red-naped sapsucker populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely lower than potential** due to fire suppression. Continued implementation of vegetative treatments to regenerate and maintain aspen on the Forest should continue to maintain red-naped sapsucker habitat and populations.

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Yellow-breasted Chat (*Icteria virens*)

INDICATOR SPECIES HABITAT

In the Apache-Sitgreaves NF, the yellow-breasted chat is an indicator for low-elevation habitats (USDA Forest Service 1987b). The yellow-breasted chat is a secretive, elusive bird that usually stays under cover in dense thickets. The yellow-breasted chat inhabits low- to mid-elevation riparian habitat. These riparian communities are comprised of various species of deciduous, broadleaf trees including narrowleaf cottonwood, Arizona sycamore, willow, ash, alder, boxelder, walnut, and the exotic tamarisk and Russian olive. Dominant tree and shrub species that occur further from the water and also in ephemeral drainages include seepwillow, desert willow, mesquite, pinyon pine, and several species of juniper.

Nests are built in small bushes, vines, and briars, about two to eight feet above ground, but occasionally on the ground. The nest is built of dead leaves, coarse straws, grapevine bark and is lined with grasses, fine plant stems, and leaves. Three to six eggs are laid between late April and August 1 in Arizona. The eggs are incubated for 11 to 12 days and young first fly 8 to 11 days after hatching. This warbler often raises two clutches of young each year (Gough 2002). The yellow-breasted chat is a frequent host to brown-headed cowbirds and an infrequent host to bronzed cowbirds (Friedmann 1963 in Terres 1991). Although a frequent target of brood parasitism, the nestlings are able to compete with cowbird nestlings, meaning that the reduction in fledging success resulting from parasitism is relatively low (27%; Martin 2004).The diet of the yellow-breasted chat consists mostly of insects gleaned from foliage and shrub stems. Fruit and berries are a secondary food source (DeGraaf et al. 1991).

The Apache-Sitgreaves NF currently has 10,101 acres of riparian habitats. Riparian areas below the Mogollon Rim are considered low elevation. These areas include multi-storied stands of Fremont cottonwood, Arizona sycamore, Arizona alder, Arizona black walnut, several willows, netleaf hackberry, and oak species. Herbaceous species composition includes a variety of mesic grass species along with rushes, sedges, and cattails along the wetted riparian zone.

Management Activities or Natural Events That May Affect Habitat

Negative: Overutilization of willows, shrubs, and other riparian vegetation by grazing livestock or native ungulates. Draining of wetlands.

Positive: Patch clearcuts the encourage growth of shrubs and bushes. In the west, the chat is clearly dependent on shrubby riparian habitat, so maintenance and restoration of riparian areas are essential (Natureserve 2004).

Forest Plan Management Direction Supporting, Maintaining, or Improving Habitat

Apache-Sitgreaves National Forest Land and Resource Management Plan, as amended (1987a), management direction for Management Area 3 – Riparian.

- Manage for and maintain at least 60% of the woody plant composition in three or more riparian species.
- Manage for and maintain at least three age classes of riparian woody plants with at least 10% of the woody plant cover in sprouts, seedlings, and saplings.
- Manage for and maintain at least 60% near-natural shrub and tree crown cover.

HABITAT CONDITION AND TREND IN THE APACHE-SITGREAVES NATIONAL FOREST

In the late 1980s, grazing by livestock and elk were resulting in adverse impacts to riparian habitat in the Forests (USDA Forest Service 1987b). Six of the 25 major watersheds in the Forest were considered to be in unsatisfactory conditions due primarily to inadequate vegetative ground cover. An estimated 34% of the Forest was in treatable unsatisfactory watershed condition. Deteriorated areas were identified as having an absence of shrubs or trees, or a lack of regeneration along streambanks. Streambanks were described as unstable with elevated stream temperatures, reduced aquatic diversity and depleted fish habitat and extremely limited terrestrial wildlife habitat. The EIS cited excessive livestock grazing as the primary cause of failure of riparian areas to improve naturally.

Since the Forest Plan was approved, actions have been taken to improve low-elevation riparian conditions. The number of livestock animal unit months (AUMs) in the Forests has been reduced significantly and several riparian areas have been excluded from livestock grazing. Cattle have been excluded from low elevation riparian areas along the Blue River, San Francisco River, and Eagle Creek since the 1993 and 1995 floods. The recovery of riparian vegetation has been dramatic (see photos below). These areas now support multi-storied stands of Fremont cottonwood, Arizona sycamore, Arizona alder, Arizona black walnut, several willows, netleaf hackberry, and oak species. Herbaceous species composition has shifted from a corridor dominated by bermuda grass and upland grass species to a variety of mesic grass species along with rushes, sedges, and cattails along the wetted riparian zone. The riparian species exhibit high vigor but are limited by poor age class distribution within the woody community. Middle-aged trees are noticeably absent from the system.

In 2000, the National Riparian Service Team (NRST) traveled to the Apache-Sitgreaves NF to provide technical assistance on riparian and fish habitat management in the Blue River and its watershed. The objectives were to assess current condition, assess potential, provide management recommendations, and provide opinion on realistic timeframes for recovery. The report cited four long-standing problems including 1) removal of large wood, 2) continuous year-long grazing, 3) road construction and maintenance, and 4) channelization and diking. While all of these problems have been eliminated or reduced on National Forest lands in the Blue River watershed, some, if not all appear to be continuing on private lands. The NRST reported that despite near complete destabilization of the Blue River historically, there is remarkable evidence of recovery on National Forest lands (USDA Forest Service 2001). Cottonwood and willow regeneration is doing well on upper reaches. One segment was reported as functioning properly. At least three age classes of vegetative recruitment were seen in some reaches including willow, cottonwood, and sycamore.

The Eagle Creek drainage was visited on March 5, 2005 to monitor flood damage resulting from recent heavy rains. Inspection revealed that large wood was accumulating in appropriate locations along river bends, and most riparian vegetation survived the flood with only small clumps of willows being uprooted.

Figure 1. Eagle Creek riparian corridor in 2005.

Figure 2. Riparian recovery along the Middle Prong of Eagle Creek.

Based on the information available **habitat quality for the yellow-breasted chat in low elevation riparian areas is fair to good with an upward trend (USDA Forest Service 2001).** Most major low-elevation riparian drainages show good recovery from historic impacts. However, **conditions are likely still below potential.** For more information on habitat trend in low-elevation riparian habitat, see Appendix A.

POPULATION TREND

Arizona

The yellow-breasted chat is widely distributed across North America (Figure 3), breeding from southern British Columbia eastward to southern Ontario and central New York, and south to north-central Florida, the Gulf Coast, Baja California and Mexico (DeGraaf et al. 1991, AOU 1998). Yellow-breasted chats winter from southern Florida and southern Texas to Central America and Panama.

The Global Heritage State rank for yellow-breasted chats is G5 (i.e., globally secure and common, widespread, and abundant) across its range, although it may be rare in parts of its range, particularly on the periphery (Figure 3). Species in this rank typically occur in more than 100 localities, and there are more than 10,000 individuals. In the United States, breeding yellow-breasted chat populations are ranked N5 (secure); nonbreeders are not ranked. The Arizona Heritage status for the yellow-breasted chat is S4, or "apparently secure" (NatureServe Explorer 2005).

National summaries of BBS data (Sauer et al. 2004) for yellow-breasted chat show a nonsignificant ($p = 0.61$) negative trend of –0.1% between 1966 and 2002. From 1980 to 2002, there has been a significant ($p = 0.03$) positive trend of 0.4%.

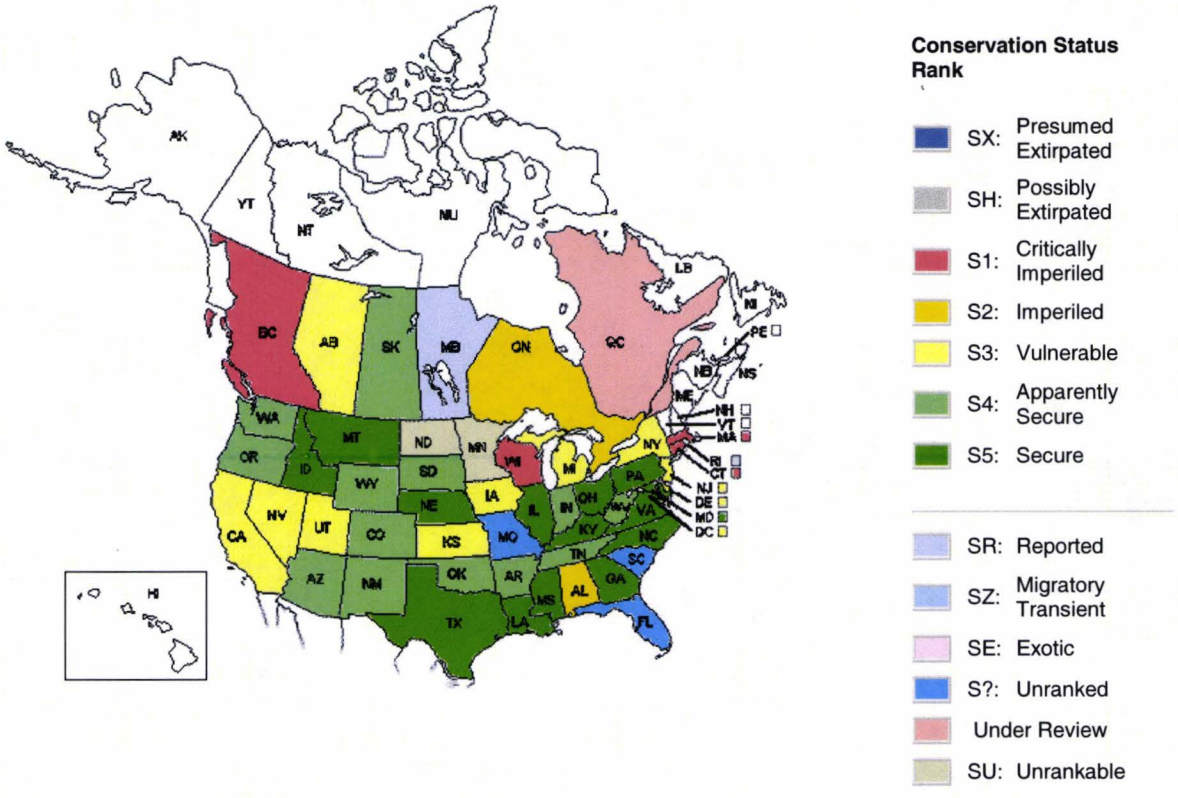

Figure 3. Status rankings for yellow-breasted chat in North America (NatureServe 2005).

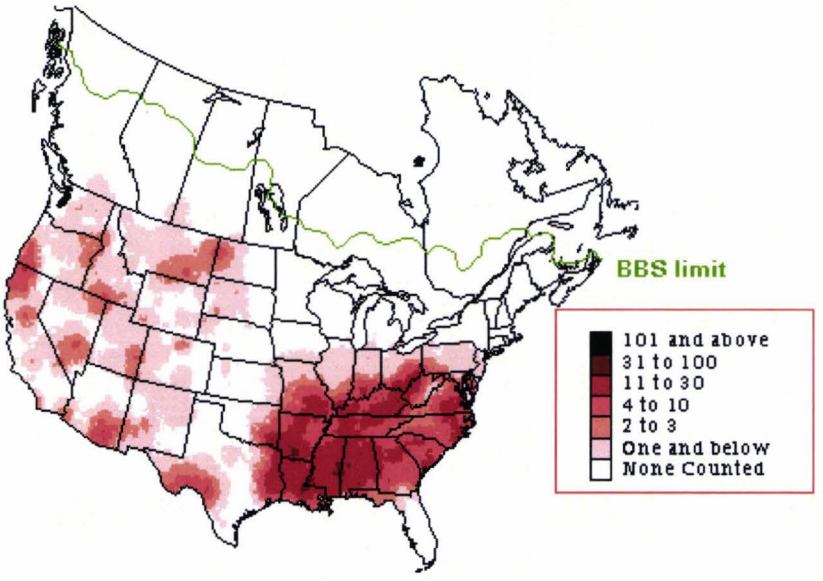

Figure 4. Yellow-breasted chat summer distribution) in North America based on Breeding Bird Surveys.

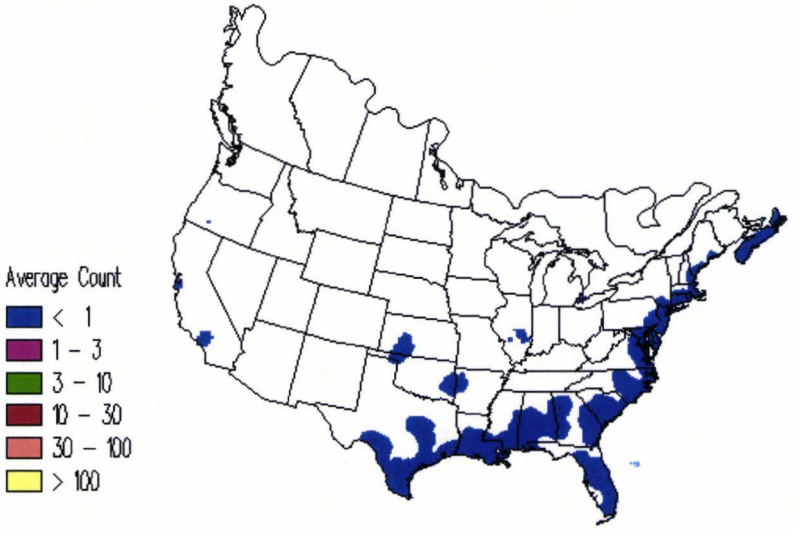

Figure 5. Yellow-breasted chat winter distribution (bottom) based on Christmas bird counts.

Arizona trend results from BBS data (Sauer et al. 2004) indicate that yellow-breasted chat populations in the state experienced an overall slight increase in population levels (1.0% per year) between 1966 and 2002 (Figure 6). Positive trends in Arizona from 1966 to 1979 were very high at 16.2% per year but dipped to 3.1% per year between 1980 and 2002. Figure 7 shows the percent population change per year based on BBS data.

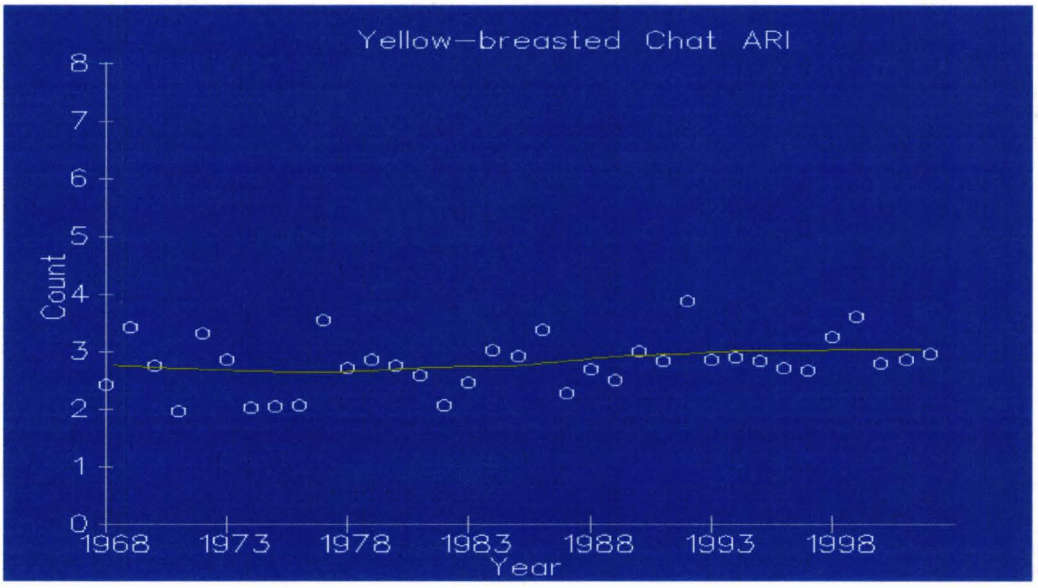

Figure 6. Yellow-breasted chat population trend data for Arizona from Breeding Bird Survey data (Sauer et al. 2003).

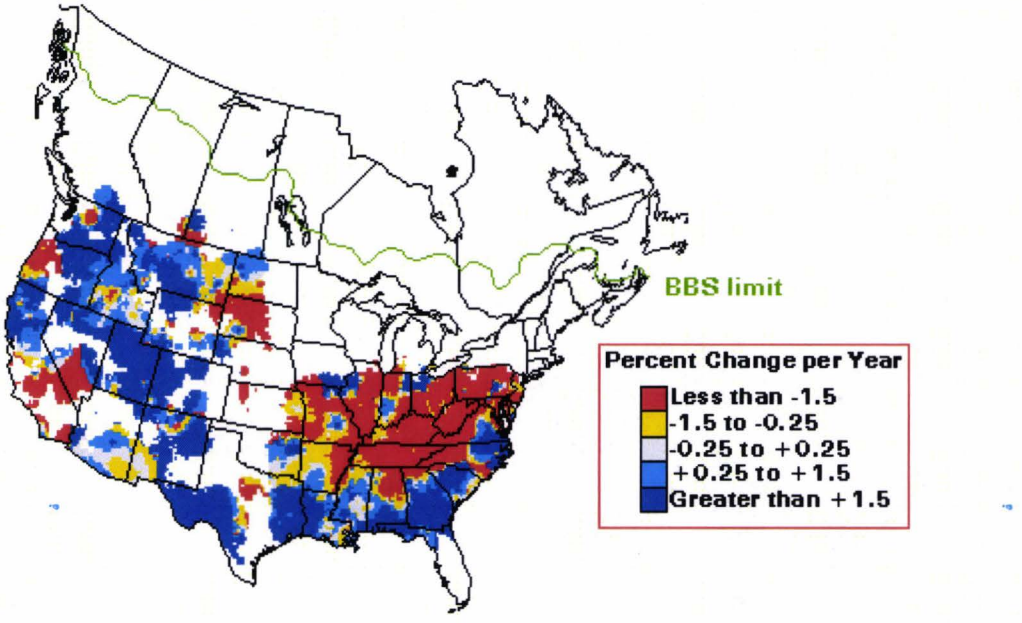

Figure 7. Percent change per year of yellow-breasted chat populations across species range (Sauer et al. 2004).

Arizona Partners In Flight (PIF) developed a species prioritization process to determine which species and habitats are most in need of conservation. The Arizona Partners In Flight Prioritization Ranking for the yellow-breasted chat is 19, based on its wide distribution and habitat loss on its breeding grounds. Birds with scores of 20 or higher were selected initially for consideration as priority species (Latta et al. 1999). The U.S. Fish and Wildlife Service recently completed a similar prioritization of birds of conservation concern (USFWS 2002) based in part on PIF rankings. That effort did not identify the chat as a species of concern in this region.

Breeding Bird Survey results allow an analysis of trend by species and state. For the yellow-breasted chat in Arizona from 1966 through 2003, the estimated trend is +1.4 percent change per year (Figure 6). This trend is considered statistically insignificant (P=0.55586). This trend estimate is a summary of the population change over the last 37 years, and does not provide information on other patterns of population change (such as cycles) over time. Sixteen survey routes[1] were used in this analysis, and the relative abundance of yellow-breasted chat observed per route was 2.54. These results corroborate the stable trend seen in the nationwide and regional data above.

Apache-Sitgreaves National Forest

The yellow-breasted chat is considered a rare summer resident in the Apache-Sitgreaves National Forest by the White Mountain Audubon Society (USDA Forest Service 1996). The Arizona Game and Fish Department conducted breeding bird surveys in support of the National Breeding Bird Atlas effort from 1994-2000. Figure 8 displays the quadrangles where chats were found to be nesting during this time. Nearly all locations of breeding chats were associated with riparian areas (shown on Figure 8 as streams).

Five Breeding Bird Survey routes are located in the Forest. These routes have been surveyed annually since 1992. Chats have been recorded on two of these routes, Sprucedale and Forest Lakes. Individual route trend information is shown in the table below. Neither trend is statistically significant. This trend information should be interpreted with caution due to a very small sample size (Sauer et al. 2004).

Table 1. Breeding bird survey trend estimates for yellow-breasted chat

BBS Route	Trend Estimate	P value	Number of Years	Average Count Per Route/Year
Sprucedale	3.83	0.26884	11	3.82
Forest Lakes	-18.58	0.14908	10	0.50

Recent MIS monitoring efforts in the Black Mesa Ranger District (unpublished data) conducted from 2001-2005 support the status of the yellow-breasted chat in the Forest. Yellow-breasted chat (n=5, 3, 0, 0, 2) were seen in riparian habitat or a station adjacent to riparian habitat. Yellow-breasted chat observations decreased noticeably from 2003 to 2004 in areas of high burn severity in the Rodeo-Chediski fire.

Chats were also recorded recently along riparian areas associated with the Blue and San Francisco Rivers, as well as Eagle Creek in the Clifton RD during surveys for southwest willow flycatchers in 2003. All bird species encountered during the surveys were recorded. Chats were found in each of these drainages.

[1] Numbers reflect the abundance of the species near the survey route. They are averages of the total counts along the route for the period 1989-1998. Because each survey route is 24.5 mi long, and consists of 50, 3-minute counts along the length of the route, the abundance estimate represents the number of birds that a very good birder would encounter in about 2.5 hours of roadside birding in the area near the BBS route (Sauer et al. 2004).

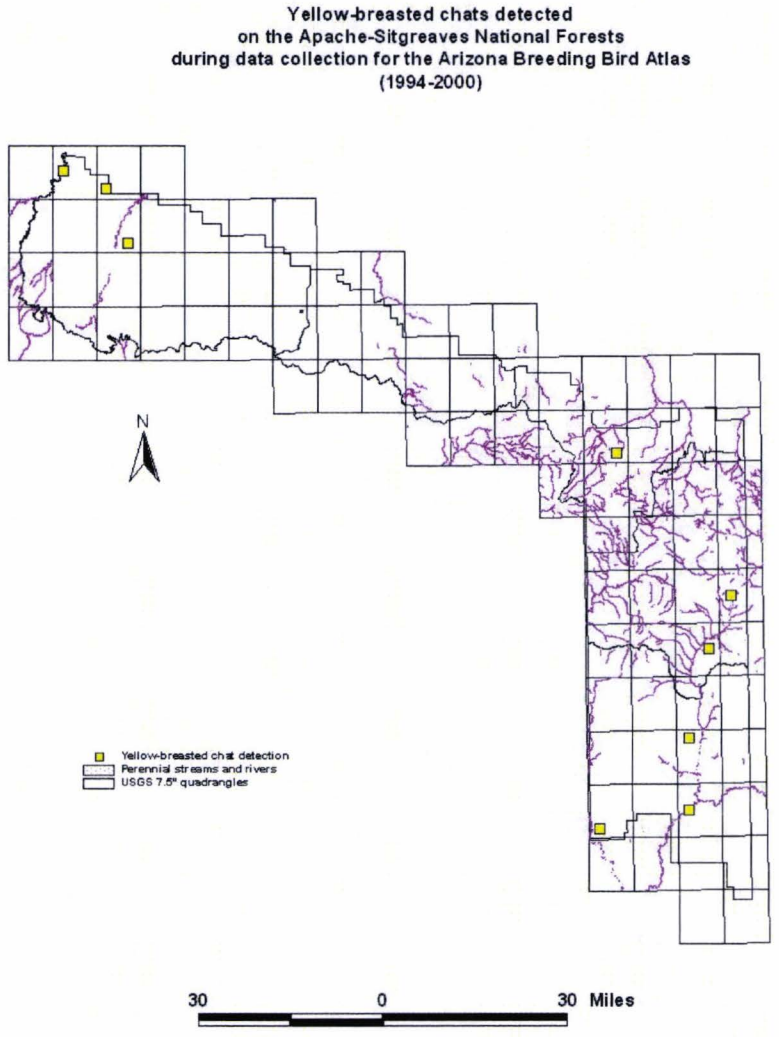

Figure 8. Locations of yellow-breasted chats detected on Apache-Sitgreaves National Forests during Arizona Breeding Bird Atlas data collections (1994-2000).

Taking into account the continuing occurrence of yellow-breasted chats in preferred habitats in the Forest, habitat trends for low-elevation riparian habitat in the Forest, and the overall population trend across Arizona, it appears that the Forest supports well distributed, reproducing populations of this species. **Currently, yellow-breasted chat populations in the Apache-Sitgreaves National Forest are considered to be stable, but likely lower than potential.** Continued implementation of conservation measures to improve riparian habitats should continue to improve chat habitat and populations.

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Appendix A - Habitat Trend Analysis

This appendix includes a discussion of habitat trends used to support the MIS species accounts. The basis for determining trend is a comparison between habitat conditions at the time of the Forest Plan and current conditions. The methods used today to determine current habitats are not always comparable to the methods used at the time of the Forest Plan. Therefore, it is not always possible either to make direct comparisons or to estimate exact habitat trends. These estimates of habitat trend include a discussion of data problems and make general trend statements given the limitations of the historic and present datasets. Sources of historic data include 1986 FIA data, information included in the Forest Plan FEIS, the Forest Plan, and other documents of the same period. Sources of current data include the RIS database, recent project level analyses, 1996 FIA data, photographic evidence, and recent research data.

The 1987 Apache-Sitgreaves Forest Plan (USDA Forest Service 1987a) designates management indicator species that use specific habitats susceptible to management activities. These species and their habitats are used to analyze the effects of site-specific projects on a broader range of wildlife. These species are:

MIS	Habitat
Mule deer	Early succession
Turkey	Late succession
Abert squirrel	Early succession
Pygmy nuthatch	Late succession
Goshawk	Late succession
Spotted owl	Late succession
Red squirrel	Late succession
Antelope	Early succession
Elk	Early succession
Yellow-bellied sapsucker	Snags (aspen)
Plain titmouse	Snags
Hairy woodpecker	Snags
Lincoln's sparrow	High elevation riparian
Yellow-breasted chat	Low elevation
Cinnamon teal	Wetlands
Lucy's warbler	Low elevation riparian

Pertinent portions of each habitat assessment will be incorporated into the appropriate species account to provide a summary of the species habitat trend.

LATE SUCCESSION

The Forest Plan EIS defines old growth for various forest vegetation types (USDA Forest Service 1987b, p. 299) based on the number and size of large trees, multiple canopy layers, snags, and down logs. The Forest Plan EIS discusses old growth deficits in the Sitgreaves NF (p. 229). The FEIS mentions that the goal for late-succession wildlife habitat is 21% (p. 200). The age class distribution of timber from the Forest Plan EIS (p. 150) shows that in 1987, the Forest had about 87,331 acres (10.8%) in stands greater than 140 years old. The Forest Plan specifies that 20% of each diversity unit is to be allocated old growth (USDA Forest Service 1987a, p. 122-2). Therefore, the goal of the Forest Plan was to increase old growth in the Forest.

In 1996, the FIA data indicated that there were 308,535 (17.4%) acres of stands greater than 150 years old at that time with 62,611 acres (3.5%) being 200 years or older. Based on this information it appears that there has been an increase in the acres of older stands of trees. However it is more likely that this difference in the number of acres of old trees is due to better data collections methods in use today versus at the time of the Forest Plan. FIA data is a forestwide sampling scheme that does not collect data on each forested stand but rather a stratified random sample of stands. The Forest does not have a complete forest inventory of what is current old growth based on stand exam data because stand exam data is not available for all areas of the Forest.

The Forest Plan requires designation of 20% of each forest cover type to be managed toward old growth. The Forest has done that on a project-by-project basis as vegetation treatments are planned. These designated old growth management stands are available in a GIS coverage. The sum of the acres that have been designated for each district are as follows:

Alpine District - 22,838 acres

Springerville - 13,742 ac

Black Mesa - 25,818 ac

Lakeside - 12,545 ac

No stands have been designated for old growth management in Clifton RD because no vegetation management projects in timber types have occurred in the District.

There are other factors to consider in making a determination of trend for late-succession habitat. Both natural and human events can affect forest succession. Timber harvest can reduce the amount of existing and developing late-succession habitat. The Forest Plan EIS considered effects to old growth in developing the Allowable Sale Quantity authorized under each alternative. The Forest Plan authorized about 18,000 acres of timber harvest annually. The figure below depicts the levels of projected versus actual timber harvest over the life of the Forest Plan. Actual harvest information is from Forest records (Beal unpub. data). The projected harvest is based on the figure listed in the Forest Plan EIS for Alternative D of 18,080 acres annually (USDA Forest Service 1987b, p. 199). Actual harvest has varied considerably between years but has been declining overall as shown by the trend line in the graph below. The recent spike in timber harvest was due primarily to salvage harvest in the Rodeo-Chediski fire. As such, it doesn't truly represent a potential effect on late-succession habitat from timber harvest. The fire itself caused loss of old growth.

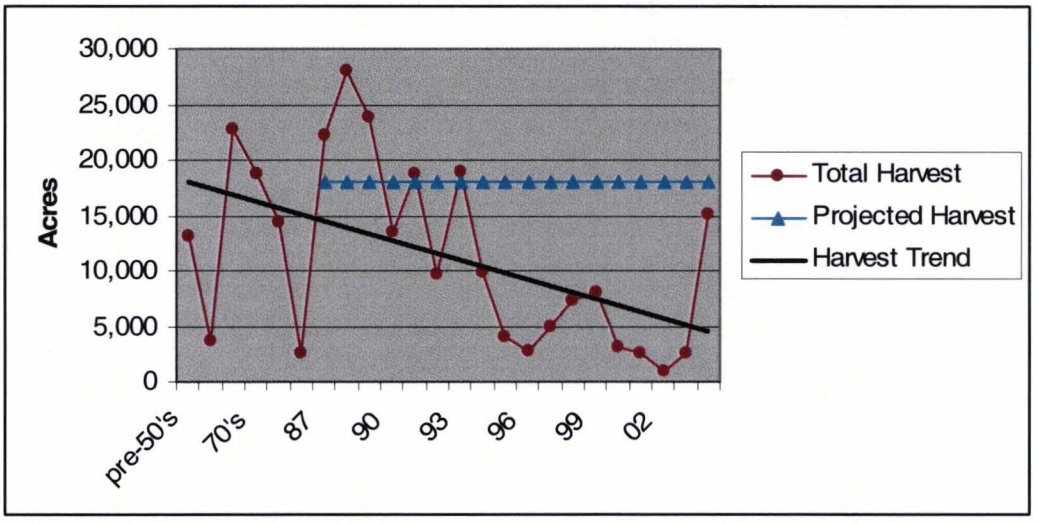
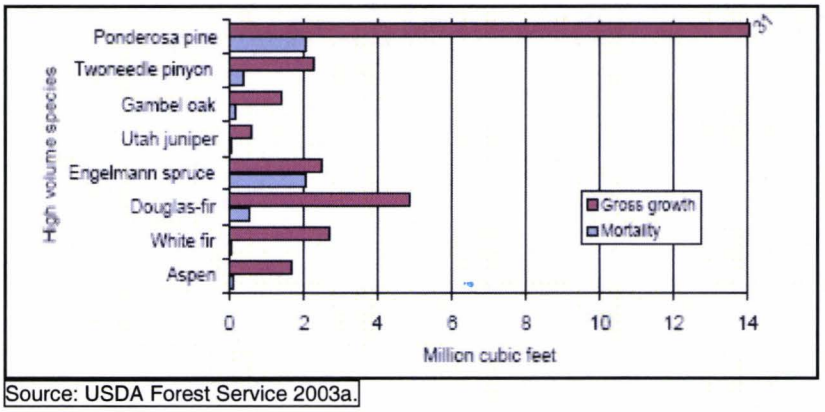


Figure 1. Actual vs. projected timber harvest in the Apache-Sitgreaves NF (1950-2004).

Another factor in the development of old growth across the Forest is the annual rate of forest growth. The FIA report (USDA Forest Service 2003a) discusses the net annual growth of trees in the Forest by comparing estimated gross annual growth and gross annual mortality. Total mortality is about 13% of total annual growth. Figure 2 compares gross annual growth to mortality for eight common forest types. Growth in most types, except Englemann spruce, far outstrips mortality in the Apache-Sitgreaves NF. Thus, the forest is getting older and thicker over time. This is another indication that late succession is continuing to develop in the Forest.



Source: USDA Forest Service 2003a.

Figure 2. Gross annual growth of live trees 5 inches diameter and greater compared to mortality on all forested land, Apache-Sitgreaves NF, 1996

As mentioned above, another event that can affect the amount and development of old growth is wildfire. Wildfire can destroy existing old growth and retard the development of future old growth by setting back forest succession. The Apache-Sitgreaves NF has sustained large wildfires since 2000. The largest of these was the Rodeo-Chediski fire of 2002. That fire burned 173,107 acres of the Apache-Sitgreaves NF. As discussed previously, the Sitgreaves portion of the Forest was deficit in old growth in 1987. Prior to the fire, only about 2% of the burned area was in "old forest" conditions (USDA Forest Service 2003b). About half of this was lost in the

fire. There were 324 stands comprising 26,546 acres that had been designated for old growth management within the burn perimeter. The 15,366 acres of this designated old growth that burned at high or moderate intensity are no longer considered appropriate for old growth management. On a Forestwide basis, the fire had only a very small effect on existing late-succession habitat. The fire had a somewhat greater effect on developing old growth.

Based on the information currently available **there appears to be an upward trend in the amount of late-succession habitat** due to protection of existing and potential old growth areas, decreasing harvest levels, and high net annual growth rate. Fires appear to have had only a small negative effect. However, actual improvements in the quality of late succession management areas will take many decades. **The upward trend in habitat will be much slower.** The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of habitat trend over the last decade of the Forest Plan including effects of recent wildfires.

EARLY SUCCESSION/GRASSLANDS

The Forest Plan EIS did not define or describe early succession habitat with regard to MIS. Early succession generally refers to forested habitats in the nonstocked or seedling/sapling stages of regeneration. But several of the Forest's MIS also use mountain grasslands in comparable purposes as early-succession forests. Both grasslands and early-succession forests are affected in similar ways by forest management activities. For the purposes of this discussion, both of these habitat types will be considered early-succession habitat.

The Forest Plan EIS shows a total of 145,428 acres of timber in age class 1-40 years old (USDA Forest Service 1987b, p. 150). This age group represents nonstocked stands (VSS1) and seedling/sapling stands (VSS2). In addition, there were 252,660 acres of mountain and prairie grasslands. Combined, these habitat types totaled 19.8% of the Apache-Sitgreaves NF. In 1996, based on FIA data there were about 244,781 acres of grasslands and 138,786 acres of nonstocked and seedling/sapling stands, for a total of 383, 567 acres or about 19% of the Forest. These figures are displayed in Figure 3.

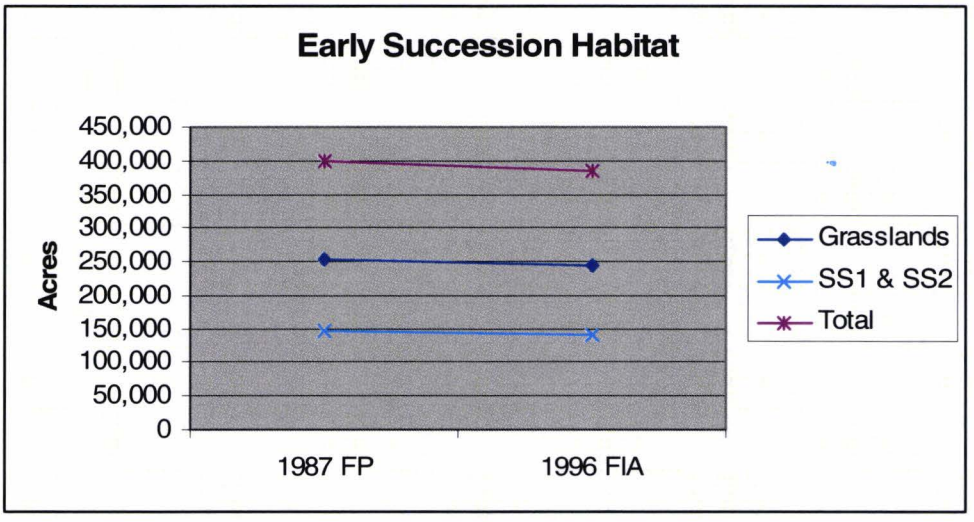


Figure 3. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-1996)

As discussed for late succession habitat, both wildfire and timber harvest can also affect the amount of early-succession habitat. Timber harvest, especially clearcuts, can create early-

succession habitat. However, clearcuts were never a very large percentage of the timber harvest program in the Apache-Sitgreaves NF. Since 1985, clearcuts constituted less than 1% of the timber treatments in the Forest (Beal 2005). Therefore, it is unlikely that declines in the timber harvest program will have any effect on the availability or trend of early-succession habitat across the Forest.

Wildfire has much greater potential to create early-succession habitat. Such was the case with the Rodeo-Chediski fire of 2002. The fire burned over 173,000 acres, converting 55% of that area back to early-succession habitat (USDA Forest Service 2003b). Figure 4 shows the changes to early-succession habitat in the Forest by 2004 due to the Rodeo-Chediski fire.

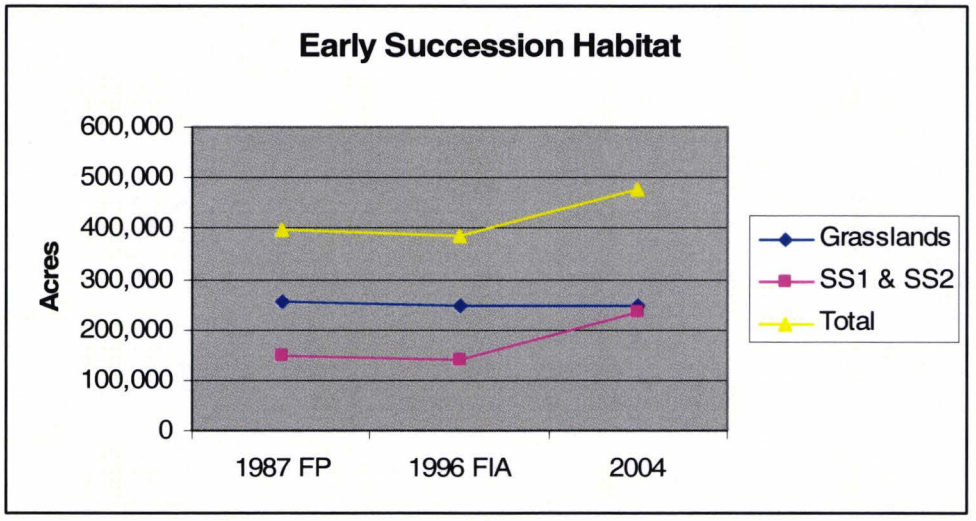


Figure 4. Amount and trend of early succession habitat in the Apache-Sitgreaves NF (1987-2004).

Early-succession habitat is by definition a transitory state except in grassland communities. Nonstocked stands and seedling/sapling areas eventually grow back into forested stands. The vast majority of the early-succession stands in the forest are in ponderosa pine, pinyon-juniper and juniper habitat types. As displayed in Figure 2, these habitat types show large net growths indicating that early-succession areas have the potential to quickly grow into later succession stages. However, the early-succession habitat created by the Rodeo-Chediski fire may be an exception. Many of the burned areas are very large and are not expected to become reestablished with trees for many years, possibly even centuries (USDA Forest Service 2003b). These areas may persist as early-succession habitat for a very long time.

Grasslands are another component of early-succession habitat. The amount of grasslands habitat in the Forest has remained stable over the life of the plan (see Figure 4). The condition of these grasslands is well described in White 2003. Generally speaking, all of the grasslands have been adversely impacted by livestock grazing dating from the late 1800s. Many of the grasslands were originally dominated by native cool-season bunchgrasses that are not tolerant of grazing. Prior to the arrival of the livestock industry, the only large animals to graze these grasslands were pronghorn antelope. It took only10-15 years of heavy grazing by cattle near the end of the last century to extensively alter these ecosystems (White 2003). As a result, most of the grasslands in the Forest are in poor ecological condition due to loss of native grasses, reduced plant diversity, decreased litter cover, and increased soil erosion. While the Forest has

regularly decreased the numbers of permitted livestock, a burgeoning elk herd has replaced cattle with similar adverse effects. Thus, the ecological trend in the grasslands has been stable but the grasslands are still in poor condition.

Based on the information currently available **there appears to be an upward trend in the amount of early-succession habitat** due primarily to the effects of wildfire. **The trend in the quality of early-succession habitat appears to be stable but grasslands are generally in poor condition** and well below potential.

SNAGS (INCLUDING ASPEN)

The amended Forest Plan defines snags as 18" diameter at breast height (DBH) and 30' tall. Aspen snags are defined as 12" DBH and 15' tall. The Forest Plan EIS does not provide any estimate of the number or size of snags in 1987, when the plan was written. The 1986 FIA data indicates that there was some level of tree mortality in the Forest predominately in the Englemann spruce type with lesser amounts in ponderosa pine. More than 50% of the mortality volume for each species was in trees >18" DBH. However, the data was not collected in a format that is convertible to snags per acre.

The 1996 FIA for Apache-Sitgreaves NF estimated that there were about 44 million standing dead trees (snags) greater than one inch in diameter, averaging 25 snags per acre. Over half of the snags occurred in the ponderosa habitat type. However, not all of these snags have much value for wildlife. About 24% of these snags were between 5 and 10.9 inches in diameter. These snags provided foraging habitat for many species of insectivorous birds. However, most cavity-nesting birds prefer even larger diameter snags for nesting purposes. The FIA data indicates that there were about 3.5 snags per acre that are 11 inches in diameter or greater at the time of the inventory and 1.4 snags per acre that are 17 inches or greater. However, these snags probably were not evenly distributed across the landscape. There were about 8.1 aspen snags per acre greater than 12" in diameter available in aspen stands with other large-diameter aspen snags scattered in other forest types (e.g. Douglas-fir and white fir).

Snags are not long lived. Snag fall-down rates vary by species, diameter, and cause of mortality. Snag fall-down rates for the Apache-Sitgreaves NF have not been estimated, but fall-down rates for other forests with similar habitat types indicate that most ponderosa snags persist for 2-20 years (Bull et al. 1997). Thus, the persistence of snags across the landscape is dependent on continuing tree mortality. Mortality in the Apache-Sitgreaves NF was estimated based on 1996 FIA data (USDA Forest Service 2003a) at about 13% of gross annual growth. Forty-five percent of this mortality was caused by disease, 28% by fire, and 15% by insects. The remaining 12 percent was attributed to weather, suppression, and animal damage, in respective order of prominence.

Snags continue to be created by insects and disease in the Forest. The Southwestern Region Forest Health Team conducted aerial surveys for the Apache-Sitgreaves Forest for insect and disease occurrence annually from 2001-2004 (USDA Forest Service 2004). The results of the surveys are displayed in Figure 5. Infestations vary widely from year to year but continue to be present in the Forest creating pockets or larger areas of new snags.

Aspen continues to be a relatively rare habitat type in the Forest. The Forest Plan EIS listed a total of 10,682 acres of aspen in 1987 or less than one-tenth of one percent. The 1996 FIA data estimated the amount of aspen to be about 27,773 acres. The RIS database in 2004 showed a total of 25,151 acres. Because of the differences in data collection methods over time, differences in acreage may not reflect actual changes in abundance. Aspen defoliators

represent from 50-100% of the defoliator activity in the Forest in any given year. Thus, aspen snags continue to be created as well.

Fire also continues to create snags in the Forest. According to the Forest's records, about 292,286 total acres have burned since 1985. Over the past 20 years, an average of 14,614 acres burned each year. However, the number of acres burned in any one year can vary considerably as shown in Figure 6. Prior to the Rodeo-Chediski fire, the average number of acres burned annually was only 3,771.

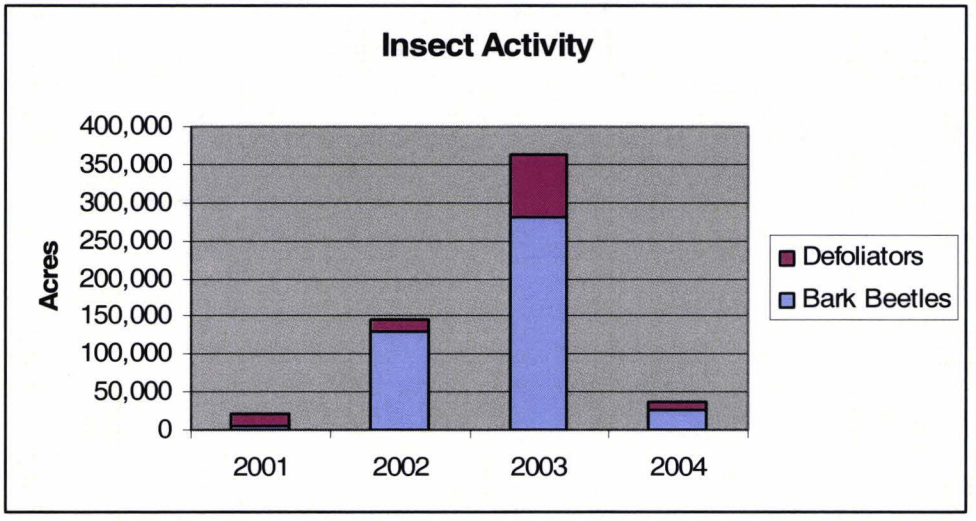


Figure 5. Summary of insect and disease activity in the Apache-Sitgreaves NF (2001-2004).

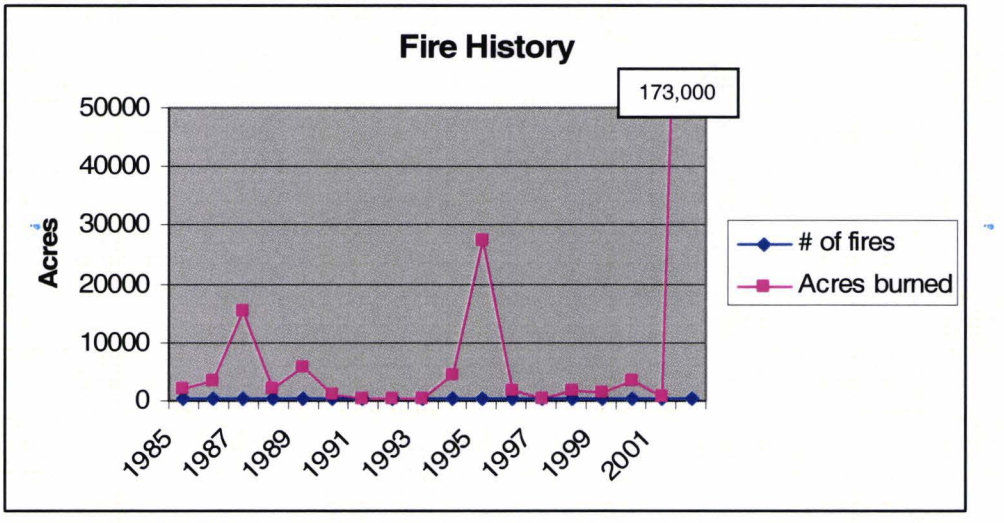


Figure 6. Summary of acres burned annually by wildfire in the Apache-Sitgreaves NF (1985-2002). Actual figure in 2002 was 173,000 acres.

The Rodeo-Chediski fire created large numbers of snags in the burned area. Prefire large snags (≥18" DBH) numbered about 0.4 snags per acre in ponderosa pine habitats and about 1.2 snags per acre in mixed conifer habitats (USDA Forest Service 2003b). No aspen stands were

burned in the fire. Postfire large snags averaged 7.6 snags per acre across the burned area. There are still pockets of low-severity burn and unburned stands with low snag numbers. Snag densities in these areas are increasing due to increased insect activity (USDA Forest Service 2003b). Snags are expected to fall over the next 2-20 years depending on tree species and size. No additional recruitment of snags is expected for at least 75 years in areas of moderate- and high-severity burn.

The ROD and EIS for the Rodeo-Chediski Fire Salvage Project authorized salvage of fire-killed trees on about 34,000 acres of the burned area. Trees to be removed are greater than 12" DBH. Two snags per acre were prescribed to be left in all salvage units. This projected was expected to result in an average of 6.3-6.8 large snags remaining across the burned landscape after treatment (USDA Forest Service 2003b).

Based on the information currently available **there appears to be an upward trend in snag habitat** over the short term due primarily to the effects of wildfire. **Aspen and aspen snag habitat trends appear stable.** Insects and disease appear to be at endemic levels and continue to create additional snags across the Forest. Snag habitat is at or above normal levels. The FIA data used as part of this trend analysis is nine years old. New FIA inventory will be collected in 2005. This information will give a better picture of snag habitat trend over the last decade of the Forest Plan, including effects of recent wildfires. Snag habitat is expected to decline within the Rodeo-Chediski fire over the long-term as most of the fire-created snags fall to the ground.

HIGH ELEVATION RIPARIAN

The Forest Plan EIS lists a total of 10,101 acres of riparian habitat. Those riparian areas above the Mogollon Rim are considered high elevation. In the late 1980s, grazing by livestock and elk were resulting in adverse impacts to riparian habitat in the Forests (USDA Forest Service 1987a). Overgrazing of riparian areas was identified as a public issue in the EIS. Six of the 25 major watersheds in the Forest were considered to be in unsatisfactory conditions due primarily to inadequate vegetative ground cover. The Fisheries and Riparian Habitat Improvement Implementation Plan for the Apache-Sitgreaves NF estimated that about 72% of the riparian forest was in unsatisfactory condition (USDA Forest Service, no date). In the Forest Plan EIS, deteriorated areas were discussed as having an absence of shrubs or trees or a lack of regeneration along streambanks. Streambanks were described as unstable with elevated stream temperatures, reduced aquatic diversity, depleted fish habitat, and extremely limited terrestrial wildlife habitat. The EIS cited both excessive livestock grazing as well as heavy browsing by elk as problems in higher riparian areas. Riparian conditions were expected to improve to satisfactory condition by the fifth decade of the Plan.

Since the Forest Plan was approved, actions have been taken to improve riparian conditions. The number of livestock animal unit months (AUMs) in the Forests has been reduced significantly and several riparian areas have been excluded from livestock grazing. Some ranger districts have entered into elk forage use agreements with the Arizona Game and Fish Department to reduce elk impacts to other wildlife habitat. These actions have helped improve riparian conditions in some areas of the Forests. However, in other areas little improvement has been documented.

The Forest uses the proper functioning condition assessment process to evaluate the health of streams during project-level analysis (USDI Bureau of Land Management 1995). Riparian areas are "functioning properly" when adequate vegetation, landform, or large woody debris are

present to dissipate energy, filter sediment, improve flood-water retention, stabilize streambanks, develop diverse channel characteristics, and support greater biodiversity.

A total of 385 miles of stream were evaluated using this method since 1998. This represents about one-third of the perennial streams in the Forest. Of the streams assessed, only 21.9% were rated as in proper functioning condition (PFC). About 50% were considered functioning at risk (FAR), and 28% were considered nonfunctioning (NF). About 5% of the streams surveyed were considered to be in a downward trend and about 27% in an upward trend. For over 50% of the stream reaches surveyed, trend could not be determined. This methodology does not evaluate riparian vegetation in terms of value to wildlife. However, streams rated as FAR or NF can be considered to have little value in terms of riparian vegetation based on parameters that are evaluated such as plant composition, diversity, root mass, vigor, and the presence of large wood. Whether streams rated as PFC have healthy riparian areas in terms of wildlife habitat is not determined. However, based on the sample of streams evaluated using PFC methodology, it appears that only about 22% are in satisfactory hydrologic condition. It is unlikely that streams not functioning properly in hydrologic terms can maintain healthy riparian habitat for wildlife.

Springs and seeps in mid- to high-elevation meadows have generally remained in poor condition. A few have been fenced to exclude livestock and/or elk and have shown great improvement. The riparian area shown in Figure 7 has been fenced to exclude livestock but still receives heavy utilization by elk.

Figure 7. Fenced riparian pasture at Greer, AZ.

The Forest has been involved in a willow recovery program since 1989 in the Springerville Ranger District (Granfelt 2003). The project has included fencing and monitoring of plant vigor and survival especially with regard to Arizona willow (*Salix arizonica*) and Bebb's willow (*Salix bebbiana*). While this recovery program targets only two willow species, it is indicative of the conditions of willows in general in the Forest. Although some willow species fare better than others under heavy grazing, none do well. Willows in riparian areas, especially at higher

elevations show severe hedging and lack of regeneration due to heavy herbivory by both cattle and elk (Figure 8) (Granfelt 2003).

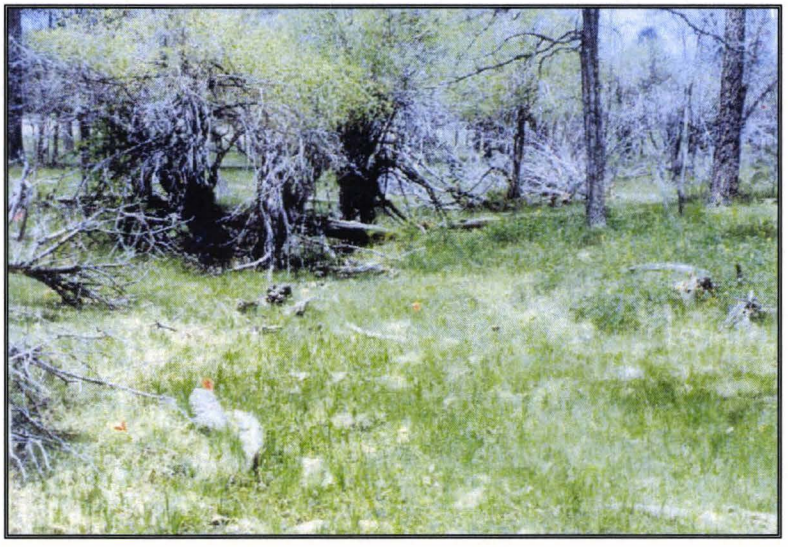


Figure 8. Willows along Los Burros Creek in May 2003 (Granfelt 2003).

However, higher elevation riparian areas remain detrimentally impacted by both elk and livestock. About 22% of the streams currently are in satisfactory conditions compared to the estimated 28% at the time of the Forest Plan. However, this difference may not be significant. Differences in assessment methodologies alone could account for this discrepancy. However, it is unlikely that there has been substantial improvement in riparian habitat across the Forest. Based on the information available, **riparian habitat quality in higher elevation areas is currently fair to poor. Trend in many of these areas appears static.** This is well below potential.

LOW ELEVATION RIPARIAN

The Forest Plan EIS lists a total of 10,101 acres of riparian habitat. Riparian areas below the Mogollon Rim are considered low elevation. In the late 1980s, grazing by livestock and elk were resulting in adverse impacts to riparian habitat in the Forests (USDA Forest Service 1987a). Six of the 25 major watersheds in the Forest were considered to be in unsatisfactory conditions due primarily to inadequate vegetative ground cover. An estimated 34% of the Forest was in treatable unsatisfactory watershed condition. Deteriorated areas were discussed as having an absence of shrubs or trees or a lack of regeneration along streambanks. Streambanks were described as unstable with elevated stream temperatures, reduced aquatic diversity, depleted fish habitat, and extremely limited terrestrial wildlife habitat. The EIS cited both excessive livestock grazing as the primary cause of failure of riparian areas to improve naturally.

Since the Forest Plan was approved, actions have been taken to improve low elevation riparian conditions. The number of livestock animal unit months (AUMs) in the Forests has been reduced significantly and several riparian areas have been excluded from livestock grazing. Cattle have been excluded from low-elevation riparian areas along the Blue River, San Francisco River and Eagle Creek since the 1993 and 1995 floods. The recovery of riparian vegetation has been dramatic (see photos below). These areas now support multi-storied

stands of Fremont cottonwood, Arizona sycamore, Arizona alder, Arizona black walnut, several willows, netleaf hackberry, and oak species. Herbaceous species composition has shifted from a corridor dominated by bermuda grass and upland grass species to a variety of mesic grass species along with rushes, sedges, and cattails along the wetted riparian zone. The riparian species exhibit high vigor but are limited by poor age class distribution within the woody community. Middle-aged trees are noticeably absent from the system.

In 2000, the National Riparian Service Team (NRST) traveled to the Apache-Sitgreaves NF to provide technical assistance on riparian and fish habitat management in the Blue River and its watershed. The objectives were to assess current condition, assess potential, provide management recommendations, and provide opinion on realistic timeframes for recovery. The report cited four long-standing problems including 1) removal of large wood, 2) continuous year-long grazing, 3) road construction and maintenance, and 4) channelization and diking. While all of these problems have been eliminated or reduced on National Forest lands in the Blue River watershed, some, if not all appear to be continuing on private lands. The NRST reported that despite near complete destabilization of the Blue River historically, there is remarkable evidence of recovery on National Forest lands (USDA Forest Service 2001). Cottonwood and willow regeneration is doing well on upper reaches. One segment was reported as functioning properly. At least three age classes of vegetative recruitment were seen in some reaches including willow, cottonwood, and sycamore.

Figure 9. Riparian recovery along the Middle Prong of Eagle Creek.

The Eagle Creek drainage was visited on March 5, 2005 to monitor flood damage resulting from recent heavy rains. Inspection revealed that large wood was accumulating in appropriate locations along river bends, and most riparian vegetation survived the flood with only small clumps of willows being uprooted (Figure 10).

Figure 10. Post-flood condition of Bear Canyon, tributary to Eagle Creek.

Figure 11. Eagle Creek riparian corridor in 2005.

Based on the information available, **habitat quality in low- and mid-elevation riparian areas is fair to good with an upward trend (USDA Forest Service 2001).** Most major low-elevation riparian drainages show good recovery from historic impacts. However, conditions are likely still below potential.

WETLANDS

The Forest Plan EIS lists a total of 3,962 acres of open water. The current GIS database shows 4,021 acres of water including lakes, reservoirs, and wetlands. In the Forests, the number and condition of shallow wetlands (natural and augmented with dikes) typically reflect variations in

the amount of snow-melt runoff (Piest 1981). Droughty conditions extending beyond a couple of years may result in many of these wetlands drying or becoming ephemeral. Some spring-fed wetlands (e.g. Sierra Blanca reservoir) and some larger, runoff-dependent reservoirs with extensive shallow-marsh zones (e.g. Luna Lake, Nelson Reservoir), also provide marshy wetland habitat (see Figure 12). Spring-fed wetlands especially may provide more dependable breeding wetland habitat. Other larger reservoirs that provide more dependable surface water (e.g. Big Lake, Crescent Lake, Black Canyon Lake, Willow Springs Lake, Woods Canyon Lake, Bear Canyon Lake, Chevelon Canyon Lake, Show Low Lake) generally lack shallow-marsh habitats (see Figure 13). These larger bodies of water are generally more important for post-breeding and migrant waterfowl than for breeding ducks. Most reservoirs support a minimal riparian zone or none at all because of fluctuating water levels.

Overuse of riparian areas including wetlands was identified as a public issue in the EIS. After the Forest Plan went into effect, the Forest developed a Fisheries and Riparian Habitat Implementation Plan (USDA Forest Service, no date) to address public concerns. At that time, the Forest estimated that 72% of the riparian areas were in unsatisfactory condition. The Forest has worked cooperatively with the towns of Show Low and Pinetop-Lakeside to create marshes from treated effluent (e.g. Pintail Lake complex, Jaques Marsh). Early in their existence (i.e., late-1970s, early-1980s), these marshes attracted ducks that especially utilized the created islands for nesting (L. Piest, pers. comm.).

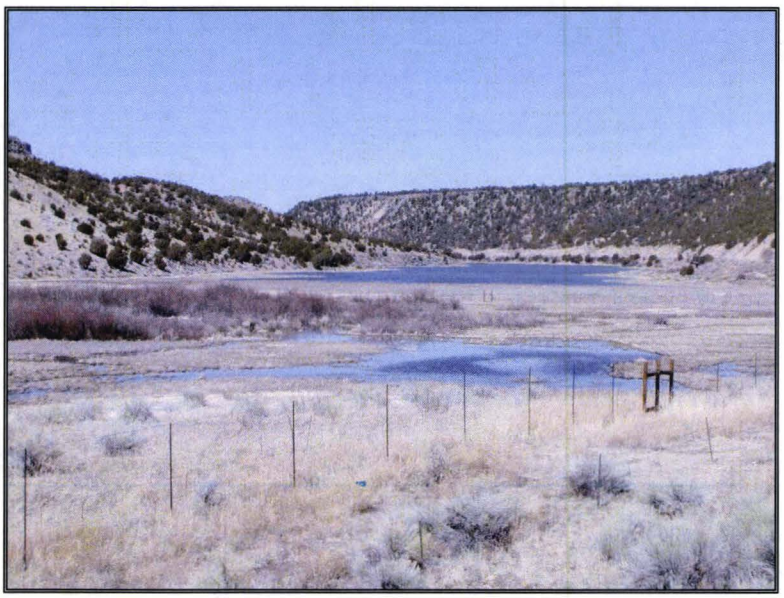


Figure 12. Nelson Reservoir has extensive wetlands and marshes at the south end. This area has been fenced to exclude livestock and elk.

Other wetland habitat improvement projects have been implemented on the Springerville and Alpine Ranger Districts (C. Denton and J. Copeland, pers. comm). About eighty acres of wetlands at Nelson Reservoir were fenced in 2003 (See Figure 12). Another 112 acres were fenced at an administrative site on Alpine RD. Dipping Vat Reservoir was pothole-blasted to create nesting islands and reseeded in 1988 (see Figures 14 and 15). A barbed-wire fence was constructed to exclude livestock grazing. Ducks Unlimited was a partner in the project. Working with the Arizona Game and Fish Department and the Springerville Ranger District, the Antelope Foundation volunteered two workdays in 2004 to repair the fence. Recently the Springerville

Ranger District worked with the Arizona Game and Fish Department and obtained a grant from Intermountain West Joint Venture for the maintenance and redevelopment of eleven wetland enhancement project sites.

Figure 13. Crescent Lake at lower water levels has essentially no wetland vegetation.

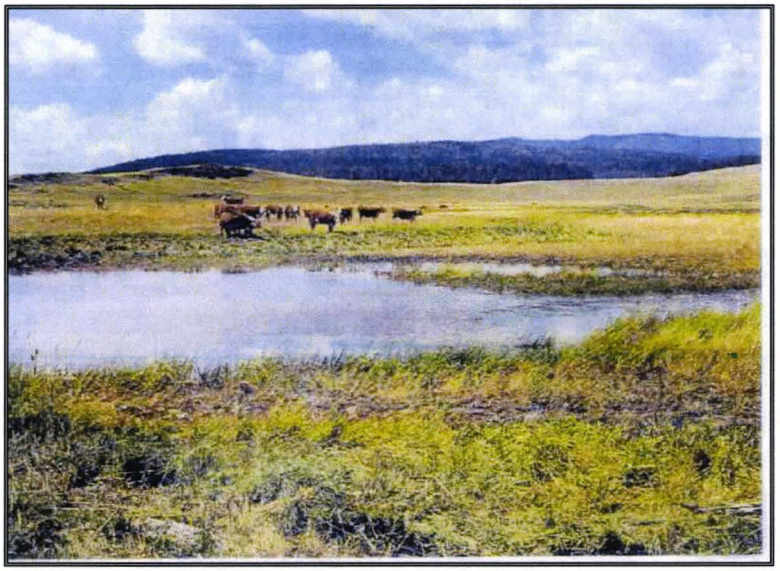


Figure 14. Dipping Vat Reservoir prior to blasting and fencing.

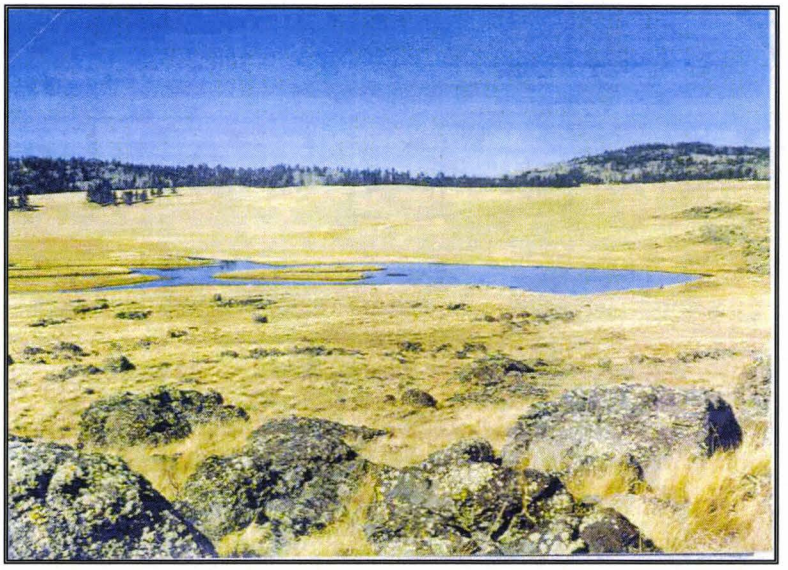


Figure 15. Dipping Vat Reservoir after habitat improvement showing nesting islands and wetland vegetation.

Based on available information, **wetland habitat in the Forest ranges from good to poor condition with an upward trend due to habitat protection projects.** Poor conditions are due to livestock use in some instances but more commonly, it is due to the fluctuating nature of water levels in wetland areas and dependence on rainfall. **The amount of wetland habitat appears stable.**

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Appendix B - Apache-Sitgreaves LRMP Wildlife Monitoring Requirements per FP Amendment #5 (1992)

Goshawk and Spotted Owl

1. Amount of old growth habitat (HC/acres); every three years; FS
2. Amount of mature and old growth timber (HC); every three years; FS

Hairy woodpecker, yellow-bellied sapsucker, & pygmy nuthatch

1. Amount of old growth habitat (HC/acres); every three years; FS

- Deleted – snag density monitoring; annually

Turkey

1. Existing HC; every five years; FS
2. Population trend; annually; AG&F

Red squirrel

1. Existing HC; every three years; FS

Elk and Mule Deer

1. Amount of hiding cover and thermal cover (HC/acres); every three years; FS
2. Population trends and distribution; annually; AG&F

Abert's squirrel

1. Existing HC; every three years; FS

Plain titmouse

1. Existing HC; every three years; FS
2. Snag densities for pinyon/juniper; every three years; FS

Antelope

1. Forage use (HC); every three years; FS
2. Population trends; annually; AG&F

Cinnamon Teal

- Deleted – amount of suitable nesting habitat; every five years; FS
- Deleted – nesting success; every five years; FS

Riparian areas, Lincoln's sparrow, Yellow-breasted chat, Lucy's warbler

- Deleted – Habitat Condition (HC); five % of streams annually; FS

T&E species

- Deleted – Amount of suitable habitat; annually
- Deleted – populations; annually; FS & USFWS

Sensitive species

- Deleted – Amount of suitable habitat and population trend; every five years; FS

Diversity

- Deleted - Successional stages of major vegetation types; every five years; FS

Aquatic macroinvertebrates

1. Species diversity and biomass; every 2-five years on improved streams identified in riparian plan; FS
2. Added – Priority One & Two streams as identified in FLMP S&Gs (HCI and BCI); every five years; FS
3. Added – Cold water stream temperatures (max. temp); every five years; FS

Appendix C - Apache-Sitgreaves LRMP Wildlife Management Direction

FOREST-WIDE STANDARDS AND GUIDELINES

- Use integrated resource management in design of timber harvests to create habitat conditions need by a variety of wildlife species in a cost effective manner. (Revised per Amendment 1)
- Where present, the following species are Management Indicator Species: Abert's squirrel, Elk, Aquatic macroinvertebrates, Mule deer, Antelope, Goshawk Pygmy nuthatch, Turkey, Red squirrel, Spotted owl, Yellow-bellied sapsucker, Plain titmouse, Hairy Woodpecker, Lincoln's sparrow, Lucy's warbler, Yellow-breasted chat, Cinnamon teal
- Maintain habitat for viable populations of all existing vertebrate wildlife species
- Within each diversity unit maintain or achieve at least 40% of the potential habitat capability for the management indicator species selected for each vegetation type.(Revised per Amendment 1)
- Where appropriate, apply prescribed fire to improve big game forage.
- Amendment 1 - Consult and cooperate with Arizona Game and Fish to analyze antelope habitat conditions and habitat management. Antelope habitat projects will be incorporated in to 10 year implementation schedule by 1990.
- Amendment 1 – Continue livestock grazing with increased emphasis on recreation, wildlife, and fishery resources, while maintaining basic soil and water values. The needs of wildlife will be considered when establishing livestock grazing capacity.
- Amendment 1 – Allotment management plans will recognize that domestic livestock may compete with big game animals (e.g. elk, deer, antelope) for available forage on some rangelands.
- Amendment 1 – On rangelands where available forage has been determined to be a limiting factor in achieving big game objectives, improved allotment management plans will be developed as described as above. Allow sufficient forage to accommodate wildlife, unless doing so would be inconsistent with multiple-use principles or with the Forest Plan. Big game habitat objectives are described in each management area and the Arizona Wildlife and Fisheries Comprehensive and Statewide Strategic Plans.
- Amendment 1 – Special considerations will be given to critical big game winter ranges in areas where big game winter range has been determined to be a limiting factor in achieving big game objectives. In those areas, no new year round grazing or new winter grazing by domestic livestock will be allowed unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – New land acquisitions in these critical winter ranges will not be used for domestic livestock grazing unless their inclusion in a grazing system better meets big game objectives.
- Amendment 1 – Total road densities should average 3.5 miles/square mile or less. Open road densities should average 2.0 miles/square mile or less.

MANAGEMENT AREA 1 - TIMBERLAND

- Old growth – until the Forest plan is revised allocate no less than 20% of each forested ecosystem management area to old growth as depicted in the accompanying table (LRMP replacement pg. 122-2).
- Implement the Forest snag policy. Provide at least 55% of a diversity unit with at least 180 snags per 100 acres. In high priority areas, including both edge habitats adjacent to meadows or other water, manage for an average of 280 snags per 100 acres.
- Provide a minimum of 2 down logs per acres (12" diameter or larger) or untreated slash piles 10-foot in diameter or a combination of down logs and slash piles over 55% of a diversity unit.
- Provide big game, non-game, and upland game habitat in aspen.
- Thermal cover for elk is a stand of coniferous forest tall and wild enough to allow animal movement and bidding with a high degree of crown closure. Emphasize maintaining thermal cover in known travelways and bedding areas.
- Hiding cover is vegetation and topographical features capable of hiding 90 percent of a standing deer or elk from human view at a distance of 200 feet or less. Emphasize maintaining hiding cover adjacent to dependable water and key openings, along known travelways, and in pine stringers.
- Protect and manage to include hiding and thermal cover and defer logging activities from May 15 to June 30 in known fawning and calving areas. This restriction may be lifted if on-the-ground inspection indicates that the area is not being used for fawning/calving and other area adjacent to the sale area are available for wildlife needs.
- Maintain turkey habitat.
- Defer slash treatment activities in turkey nesting areas from April 15 through June 30.
- Manage for turkey nesting cover through modified slash treatment. Leave scattered patches, at least ¼ mile in size, of untreated slash within ½ mile of dependable water in actual or potential turkey nesting areas.
- Protect special wildlife features and maintain cover adjacent to elk wallows, salt licks, seeps, etc.
- As needed to meet habitat capability, protect red squirrel caches at a density of one cache per 2 acres. Retain all trees within a 26-foot radius from the cache to maintain nest tree groupings.
- As needed to meet habitat capability, retain at least 20 Abert Squirrel nest tree groups per 100 acres.
- In key big game habitat, manage for at least 30 percent of the mixed conifer to meet hiding cover needs. Give priority for cover management in drainage bottoms, heads of drainages, and isolated pockets of mixed conifer. Defer logging in these areas from April 15 to June 30.

MANAGEMENT AREA 2 - WOODLAND

- Manage for the following indicator species: plain titmouse, mule deer, elk, antelope.

- Maintain or improve big game habitat. Limit created openings on big game winter range to no wider than 1,200 feet. Leave cover strips at least 500 feet wide between openings, openings are not to exceed 40 acres. Maintain no less than the current level of openings on current antelope ranges. Emphasize openings adjacent to pine stringers.
- Manage areas that are harvested for fuelwood. Emphasized openings on existing and potential big game range. Retain thermal cover and hiding cover on north and east exposures. Manage fuelwood sales to break up large areas of single-age classes. Leave cavity excavated trees, shrubs, and oak in openings created for wildlife.
- The alligator juniper component of the ponderosa pine is managed primarily for maintenance and enhancement of wildlife habitat by the following criteria: In areas where alligator juniper comprises less than 50 percent of the toatl basal area, retain live alligator juniper trees $\geq$ 12 inches D.B.H. In areas where alligator juniper comprises more than 50 percent of the basal area, live trees > 12" D.B.H. may be removed if < 25 percent of the crown is living. In both cases some of the live trees < 12" D.B.H. may be removed. Retain at least 40 percent of the trees.
- Retain ponderosa pine stringers as inclusions.
- Areas needing additional forage for elk are given first priority in scheduling firewood/wildlife habitat treatments. Treatments are usually done in acres remote from major disturbance.
- Mange for hiding cover and thermal cover in known fawning and calving areas.
- Manage for at least an average of 100 snags per 100 acres on 40 percent of the pinyon-juniper woodland acres in each diversity unit. Snags are at least 9" diameter at the root collar and at least 10' high.
- Defer firewood activities from may 15 to June 30 in known fawning and calving areas.
- Manage for at least 20 percent of each diversity unit in thermal and hiding cover. Emphasize cover management in travelways, bedding areas, reproductive areas, and adjacent to key openings. Cover is managed to provide at least 60% crown cover and at least 500' wide.
- In treated stands manage for small game and nongame by leaving an average of one slash pile per three acres in the woodland type or leave lopped and scattered slash on 30 percent of the area.

MANAGEMENT AREA 3 – RIPARIAN

- Manage for the following indicator species: Lincoln's sparrow, Lucy's warbler, yellow-breasted chat, and aquatic macroinvertebrates.
- Improve wetlands in accordance with the Forest Wetlands Management Plan.
- Improve wintering waterfowl habitat.
- Maintain or improve nesting cover in conjunction with construction of waterfowl nesting islands.
- Maintain and improve wetland habitat by planting waterfowl forage species on existing waterfowl islands and shorelines.

- Maintain or improve waterfowl nesting cover on existing waterfowl nesting islands and shorelines.
- Maintain riparian and meadow communities by providing waters for livestock and wildlife away from sensitive riparian areas.
- Establish exclosures to determine riparian vegetation potential on representative sites.
- Wildlife use will be controlled in areas in unsatisfactory condition where wildlife use is a significant causative factor affecting condition.
- Manage for and maintain at least 60% of potential habitat capability for Apache trout, rainbow trout, brook trout, brown trout, loach minnow, and Little Colorado spinedace.
- Manage for and maintain at least 80% of near natural shade over water surfaces.
- Manage for and maintain at least 80% of streambank total linear distance in stable condition.
- Prevent siltation not to exceed 20% fines in riffle areas.
- Maintain 80% of the spawning gravel surface free of inorganic sediment.
- Manage for stream temperatures not to exceed 68 degrees F. unless not technically feasible.
- Manage for and maintain at least an 80 Biotic Condition Index on all perennial streams.
- Manage for and maintain at least 60% of the woody plant composition in three or more riparian species.
- Manage for and maintain at least three age classes of riparian woody plants with at least 10% of the woody plant cover in sprouts, seedlings, and saplings.
- Manage for and maintain at least 60% near natural shrub and tree crown cover.

MANAGEMENT AREA 4 – GRASSLANDS

- Evaluate need, maintain and improve meadows by eliminating competing conifers, stabilizing gullies to restore water tables, and reseeding with species desirable to wildlife.
- Evaluate need and construct fences where necessary to protect key mneadows from grazing.
- When springs are developed in meadow communities, riparian areas, or other sensitive area, protect these areas by piping the water to water developments in adjacent less sensitive areas.
- Maintain existing antelope range.

MANAGEMENT AREA 11 - WETLANDS

- Determine the need and then maintain and improve wetland habitat by planting waterfowl forage species along the shorelines in the firs decade. Complete by 2010.

- Construct waterfowl islands, and create potholes in wetland areas to provide nesting habitat.

RECORD OF DECISION FOR AMENDMENT OF FOREST PLANS (1996)

- Provides direction relative to the management of both Mexican spotted owl and northern goshawk habitat.